EPA Region 1 RAC 2 Contract No. EP-S1-06-03

September 20, 2017
Nobis Project No. 80022.09

Via Electronic Submittal

U.S. Environmental Protection Agency, Region 1
Attention: Ms. Lisa Thuot, Remedial Project Manager
5 Post Office Square, Suite 100
Boston, Massachusetts 02109-3919

Subject: Transmittal of DNAPL Extraction System Operations and Maintenance Report #3
Nyanza Chemical Waste Dump Superfund Site – Operable Unit 2,
Ashland, Massachusetts
Remedial Action
Task Order No. 0022-RA-RA-0115

Dear Ms. Thuot:

Enclosed is the DNAPL Extraction System Operations and Maintenance Report #3 for the Nyanza Chemical Waste Dump Superfund Site, Operable Unit 2, located in Ashland, Massachusetts.

Should you have any questions or comments, please contact me at (603) 513-7331, or jvernon@nobiseng.com.

Sincerely,

NOBIS ENGINEERING, INC.

James H. Vernon

James H. Vernon, Ph.D.
Senior Hydrogeologist

Enclosure

c: File No. 80022/MA

Nobis

Engineering a Sustainable Future

DNAPL Extraction System Operations and Maintenance Report #3

Nyanza Chemical Waste Dump – Operable Unit 2
Ashland, Massachusetts

Remedial Action
EPA Task Order No. 0022-RA-RA-0115

REMEDIAL ACTION CONTRACT
No. EP-S1-06-03

FOR

US Environmental Protection Agency
Region 1

BY

Nobis Engineering, Inc.

Nobis Project No. 80022

September 2017

U.S. Environmental Protection Agency

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DNAPL Extraction System Operations and Maintenance Report #3

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Ashland, Massachusetts
Remedial Action
EPA Task Order No. 0022-RA-RA-0115

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James H. Vernon, Ph. D.
Senior Hydrogeologist

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1.0 INTRODUCTION

This Operation and Maintenance (O&M) Report was prepared by Nobis Engineering, Inc. (Nobis) to present system operations and maintenance information for the two Dense Non-Aqueous Phase Liquid (DNAPL) Extraction Systems at the Nyanza Chemical Waste Dump Superfund Site, Operable Unit 2 (OU2) located in Ashland, Massachusetts (Site). DNAPL recovery is performed under the United States Environmental Protection Agency (EPA) Region I Remedial Action Contract 2, No. EP-S1-06-03, EPA Task Order No. 0022-RA-RA-0115.

The former Nyanza facility is located on the north side of Megunko Road in the Town of Ashland, Massachusetts. A former landfill on Megunko Hill (now capped) is located to the southwest of the former Nyanza facility (Figure 1-1). Historical, chemical-related operations at these properties have likely contributed to releases that impact groundwater in the Site study area, which includes groundwater contamination plumes that have migrated north and east from the former Nyanza property, across the freight and MBTA railroad tracks, and towards the Sudbury River and downtown Ashland.

1.1 Purpose of This Report

DNAPL was encountered during environmental investigations in 1994, and during subsequent drilling efforts (2012) performed to identify specific locations and depths where DNAPL is present at the Site. Two DNAPL extraction systems were installed at the Site in 2013, (one at the Nyacol facility located at the former Nyanza property, and one at Worcester Air Conditioning (WAC), located north of Nyacol across the railroad tracks) in bedrock depressions where DNAPL is known to collect. A site plan is included as Figure 1-2.

This “annual” summary report is the third of three reports completed to date and covers O&M activities performed since start-up, but focuses on activities and performance for the reporting period from September 1, 2016 to August 31, 2017. With the agreement of EPA, the reporting period for the first report was extended to the first 2 years of operation, and the first O&M report covered the period that started on September 10, 2013 and ended on September 15, 2015). The second O&M report documented system occurrences from September 16, 2015 through August 31, 2016.

1.2 Summary of the Site Conceptual Model

The objective of the remedial design for the DNAPL extraction systems was to implement the physical extraction of DNAPL from the deep overburden groundwater aquifer, and possibly from shallow fractured bedrock, through a DNAPL extraction/collection system.

In 1994, DNAPL was discovered in MW-113A (Figure 1-2), located at WAC, north of the Nyacol facility and across the railroad right of way. The DNAPL found at this location was a reddish, dark brown liquid with a low viscosity, and it had a very strong almond-like chemical odor. Potential DNAPL sources include:

- A former concrete "vault" adjacent to the main processing building of Nyanza, Inc. previously used for solids separation prior to effluent discharge.
- Two former lined lagoons south of Megunko Road.
- Two former settling ponds (1 and 2) south of Megunko Road (between the lined lagoons and Trolley Brook).
- The former landfill on Megunko Hill (capped area).
- The former Chemical Brook.
- Area E (the lower industrial area between Megunko Road and the railroad tracks).

1.2.1 Record of Decision

OU2 is a groundwater plume of organic contamination extending downgradient from Nyacol in a north/northeasterly direction toward the Sudbury River. The OU2 Record of Decision (Interim ROD) was issued in 1991 as an interim remedy, with the intent to further evaluate the effectiveness of groundwater extraction and treatment to meet drinking water standards after an initial operational period of 5 years (EPA, 1991). Design of a treatment system was completed by 1992, and a pilot test of the system was initiated in 1994; however, DNAPL entered the pumping test well during initial pilot-phase testing. Implementation of a groundwater treatment system was postponed because the treatment system had not been designed to mitigate DNAPL.

The U.S. Army Corps of Engineers (USACE) and its contractor conducted initial evaluations of the DNAPL, including feasibility analyses for various treatment techniques, as well as a conceptual design for an extraction system with off-site treatment/disposal (ICF, 2006).

The presence of DNAPL, coupled with the establishment of a vapor intrusion pathway to indoor air, caused EPA to issue an Explanation of Significant Differences (ESD) document in 2006 (EPA, 2006). The ESD document described these newly understood site conditions and consequently the need for different remedial action approaches than had been presented in the Interim ROD. These approaches were to include DNAPL extraction and off-site treatment, groundwater monitoring, installation of vapor mitigations systems, additional indoor air testing, and installation of small diameter monitoring wells and piezometers in selected areas.

1.2.2 DNAPL Investigations

In 2009, EPA implemented the first of two step drilling investigations designed to evaluate other potential sources of DNAPL, specifically DNAPL in bedrock fractures. This investigation targeted the area of MW-113A at WAC where DNAPL was previously detected. Seven borings (including one monitoring well) were advanced into bedrock at the WAC and Nyacol properties.

The investigation started south of MW-113A (at WAC) and adjacent to the railroad right of way (ROW), and proceeded in accordance with a decision tree established in the work scope for an additional six borings (for a total of seven borings at WAC and at Nyacol, combined). This decision tree directed subsequent boring locations based on conditions encountered in previous borings. Drilling extended south on the WAC property and along the railroad for five borings. Two additional borings were advanced at the Nyacol facility, across the railroad ROW.

Although DNAPL-like odors were detected in wash water/groundwater encountered in two of the borings, DNAPL was not observed during this investigation.

In 2012, EPA implemented the second step drilling investigation as a continuation of the 2009 step drilling program. Nobis conducted this effort to evaluate the former chemical storage vault associated with the former Nyanza facility as a potential DNAPL source. Borings were once again advanced in accordance with a decision tree used to determine subsequent boring locations. Seven borings (including one monitoring well) were advanced into bedrock at Nyacol to identify a potential DNAPL pool contributing to groundwater contamination.

Halfway through the investigation, DNAPL contamination was encountered in drilling wash-water while advancing boring B-11 through bedrock. Nobis installed a monitoring well at this boring location. Although Nobis noted DNAPL odors and elevated PID readings in overburden soils at several other boring locations, bedrock groundwater contamination by DNAPL was observed only at B-11.

No other monitoring wells were installed during this step drilling investigation. Results of the first step drilling program were presented to EPA in a report titled Technical Memorandum for Step Drilling Program (at WAC and Nyacol; January 2010), and results of the second step drilling program (at Nyacol) were presented to EPA in a report titled Technical Memorandum for Step Drilling Program (December 2012).

1.2.3 Groundwater Monitoring

Currently no sampling program is in effect at OU2, but a round of groundwater sampling of 30 existing and three new monitoring wells is scheduled for autumn 2017 under a different Task Order.

1.2.4 Recovery System Installation

In the 2013 DNAPL Extraction System Evaluation Report, Nobis presented a conceptual design for the DNAPL recovery systems. EPA installed DNAPL recovery systems at MW-113A at WAC and MW/B-11 at Nyacol in September, 2013. These wells previously exhibited evidence of DNAPL, including a measured DNAPL thickness of up to 4.4 feet. The wells are approximately 220 feet apart on opposite sides of the railroad tracks and in the general vicinity of the former disposal vault, which is believed to be the primary source of the DNAPL. Refer to Appendix A for extraction well construction logs and Figure 1-2 for extraction well locations.

DNAPL may be, or may have been, present in the soils at the WAC and Nyacol properties (mainly silty sands and fine sands) and may have migrated vertically downward into deeper individual bedrock fractures. The recovery systems are designed to extract localized DNAPL accumulations identified during previous drilling activities, to recover DNAPL within the wells, and to encourage the DNAPL to flow toward MW-113A and MW/B-11 for extraction and disposal. System construction and operations are described in the following sections. Recovery system construction was documented in the DNAPL Extraction Construction Summary report submitted to EPA in February 2014.

1.3 Statement of Remedy Goals and Conditions for Terminating the Remedy

The remedy approach established in the Explanation of Significant Differences (EPA, 2006) document includes both containing and removing localized DNAPL pools in bedrock depressions near the source area. Cleanup and containment of free-phase DNAPL and DNAPL/water emulsions will help to mitigate, reduce, or slow the migration of groundwater contamination plumes throughout the Site study area.

The effectiveness of this portion of the interim remedy is evaluated by assessing the recovery of DNAPL from the Nyacol and WAC removal systems. Defined conditions to terminate the remedy have not been established.

1.4 Remedy Description

The DNAPL extraction systems recover DNAPL pools from local bedrock depressions. Diagrams that depict the DNAPL recovery systems processes are included as Appendix B. These systems do not treat recovered liquid. Liquid is collected into holding tanks and disposed of off-site once the tanks are full. Tank vapors are passively treated on-site via 55-gallon drums of granular activated carbon (GAC) to mitigate explosion hazards and protect workers from hazardous breathing conditions.

The DNAPL recovery system layouts are depicted in Appendix C. Both extraction wells are outfitted with enclosures to protect the wells and house recovery system components. Each extraction well is equipped with a pneumatic down-hole recovery pump set near the bottom of the well to recover DNAPL. These pumps, powered by nitrogen gas, push product into holding tanks within the system enclosure. Holding tanks are evacuated by an off-site disposal contractor as they become full.

Electronic pump controllers (one per pump) manage recovery pump operations, and cellular autodialers automatically report alarm/problem conditions to operations personnel. Tank and enclosure sensors report system conditions via the autodialers, and are also capable of ceasing pumping operations should emergency conditions warrant pump shutdown.

Vapors off-gassing from liquids within the storage system require treatment and removal since the storage system is sealed. Accumulated gases within the storage system passively flow to and through GAC vapor treatment systems and are vented out through the top of the extraction system enclosure. Backflow preventers, check valves, and other safety components prevent liquids and vapors from flowing the wrong way and add to the safe operation of the recovery systems.

1.4.1 Extraction System Components

DNAPL recovery system components and system process descriptions are summarized below:

- System Enclosures – Each extraction system is enclosed within a wooden structure (i.e. shed), secured with a lock and key. Secondary containment built into each shed will contain liquids within the shed in the event of a leak or spill. System enclosures are outfitted with heat, lighting, electric power, and insulation. An exhaust system prevents potentially hazardous breathing conditions from developing within the enclosure by circulating air, gases, and vapors from within the building to the outside.

- Extraction Wells – MW-113A and MW/B-11 are 2-inch stainless steel monitoring wells retrofitted as extraction wells. Both wells are screened in bedrock and span fractures judged to be the fractures most capable of fluid transport in the upper portion of the bedrock at the borehole locations. MW-113A is screened from 46 feet below ground surface (ft bgs) to 51 ft bgs. The screen begins 3 feet below the bedrock surface (43 ft bgs) and has a 4-foot sump below the bottom of the screen. MW/B-11 is screened from 11.3 ft bgs to 21.3 ft bgs; the screen begins 2.3 feet below the bedrock surface (9 ft bgs) and has a 2-foot sump below the screen.

- Recovery Pumps – Each extraction well is equipped with a QED LP1301 Pulse Pump. These stainless steel, submersible, positive air displacement pumps are set near the bottom of the wells to recover DNAPL. Pneumatic pump operation is managed by electronic pump controllers that cycle gas from nitrogen cylinders within the system enclosures. Gas pressure displaces DNAPL within the pumps, bringing it to the surface and into the storage system. The pumps have internal check balls that seat after pumping to prevent backflow and siphoning, thus allowing the pumps to refill with DNAPL half-inch solid Teflon tubing carries recovered fluids to the storage tanks.

- Pump Controllers – QED C100M pump controllers installed at each system allow for specialized pump control via programmable system settings. Filling and discharge intervals and pumping frequency settings were adjusted to maximize DNAPL recovery and minimize groundwater collection. Recovery pump controllers are powered by AC adapters. A solar panel helps supplement power requirements of the treatment system at the Nyacol property. Each pump controller contains backup rechargeable batteries which allow for continued system operation in the case of power failure; however, pump controllers will shut down and pump settings will need to be reprogrammed if backup battery power is exhausted.

- Pump controllers are located outside the treatment sheds in a wall-mounted, heated, waterproof box, which allows for system operations in all weather conditions. Pump controllers are not stored inside the system enclosure because they are not intrinsically safe.

- Dual-Walled Storage Tank – Each DNAPL Extraction System is equipped with a 270-gallon, dual-walled stainless steel storage tank. These tanks store recovered DNAPL until it is removed for off-site disposal. A sight-glass is installed to monitor fluid levels in the tank.

- A high-level float switch prevents tank overfilling by shutting off recovery pumps when the tank liquid fills to the level of the switch. System operators can over-ride this alarm condition by manually acknowledging the alarm condition. The pumping program will resume until the liquid in the tank reaches a separate high-high level float switch. Pumps will be disabled if the high-high switch is triggered. Pumping cannot resume until the liquid in the tank is lowered to a level below the high-high float switch; the high-high switch cannot be over-ridden.

- Autodialer Alarm Reporting System – Each DNAPL extraction system is equipped with a Sensaphone Cell682 autodialer. This component uses a cellular telephone signal to notify maintenance personnel of system problem/alarm conditions via a phone call or text message. This system allows remote sensing, notification, and limited control of process instrumentation including level indicators and temperature switches; however, the main purpose of the autodialer system is to receive and notify operations personnel of alarms and maintain a history of alarm conditions. Autodialer settings allow for multiple contact reporting to ensure alarm conditions are acknowledged and addressed in a timely manner. All process control system components are mounted in weatherproof boxes on the exterior of the system enclosures to maintain intrinsic safety of the systems.

- Ventilation System – Each ventilation system consists of vapor-phase GAC units, a flame arrestor, and a vent pipe. GAC units treat vapors collected in the storage tank prior to discharge to the atmosphere. The flame arrestor prevents propagation of flames to potential vapor mixtures within the liquid storage system. Treated vapors are passively vented to the atmosphere via a series of 2-inch flexible hoses and schedule 10 black iron pipe. Additional piping components include pressure indicators, sample ports, fittings, and a backflow preventer.

1.4.2 Construction and Startup Chronology

Physical construction activities by Nobis subcontractors, including Groundwater and Environmental Services, Inc., AquaRep, and others began on June 13, 2013 at an off-site location, with QA inspections by Nobis. On September 4, 2013, the two completed treatment systems were delivered to their respective sites, following a final inspection and approval by Nobis on September 3, 2013. Initial testing was conducted on September 6, 2013 after a three-month construction period.

Nobis initiated system startup at Nyacol and WAC on September 10, 2013 and September 11, 2013, respectively. Nobis performed system shakedown tests at the conclusion of the startup process to adjust system settings, maximize DNAPL product recovery, and minimize groundwater volume. Nobis optimized DNAPL extraction by modifying pump intake settings and pumping frequency/cycling durations over 24 system shakedown visits conducted between September 12, 2013 and January 29, 2014.

Nobis prepared an O&M manual to present procedures to properly operate and maintain the extraction systems. The O&M manual includes system specifications as well as the manufacturers' operations manuals for major system components. Routine O&M visits, conducted on a bi-weekly average since the end of the shakedown period, continue to occur today.

2.0 OPERATIONS SUMMARY

The reporting period of performance (POP) for this O&M report #3 is September 1, 2016 through August 31, 2017. The first O&M report included operations from September 10, 2013 to September 15, 2015. The second O&M report documented system occurrences from September 16, 2015 through August 31, 2016.

Twenty-five O&M visits were conducted over the current POP, with an average of two bi-weekly O&M visits per month.

DNAPL Extraction System O&M is performed to accomplish the following objectives:

- Provide for safe operation of the DNAPL Extraction System;
- Maintain specified equipment conditions to ensure the systems are operational;
- Collect and evaluate physical and chemical data to determine system effectiveness;
- Modify the operation of the DNAPL Extraction System, as needed; and
- Maintain compliance with regulatory requirements, such as off-site transportation and disposal of DNAPL.

Maintenance activities are divided into the following categories:

- Routine O&M – includes regular visits to the Site to monitor operations. Maintenance is preventative and conducted on a scheduled basis. Routine O&M is part of the regular work schedule. It evaluates system performance, enhances the life and performance of equipment, and reduces process shutdown conditions resulting from equipment failure.

- Non-Routine Maintenance – is necessary to correct any malfunctioning equipment or failure discovered during periodic monitoring, routine maintenance activities, or system reporting. This also includes maintenance related to startup and shutdown events.

2.1 Routine Operation and Maintenance Activities

Routine O&M of the DNAPL Extraction System is performed for system performance evaluation and protection of human health and the environment. Operations personnel performing the O&M tasks conduct the following activities:

- Observe DNAPL Extraction System and confirm it is operational;
- Operate the recovery pumps and check for blockage or clogging;
- Monitor recovery rates and frequencies to optimize DNAPL recovery;
- Record and track total volume of DNAPL recovered;
- Observe extraction and ventilation system piping and check for leaks and signs of corrosion;

- Monitor storage tank contents and schedule off-site disposal as needed;
- Monitor vapor-phase carbon vessel performance and schedule replacements, as needed;
- Monitor pneumatic pump air sources (nitrogen tank, T-101) and replace/refill, as needed;
- Inspect the solar panel for any damage and confirm operational;
- Mow vegetation, remove snow, and other housekeeping-related tasks (as needed);
- Complete the O&M Site Visit form; and
- Complete the routine maintenance activities in accordance with the maintenance schedule (Appendix D). Routine O&M activities are recorded on the O&M Site Visit form (Appendix E).

2.2 Non-Routine Maintenance

Operations personnel perform non-routine maintenance to correct equipment malfunctions or failure. Non-routine maintenance is the process that identifies, evaluates, and corrects any failed equipment or system failures that are not routine, foreseeable, or anticipated. Non-routine maintenance is also recorded on the O&M Site Visit form. Non-routine maintenance may include system maintenance activities such as fitting or valve replacement, pump cleaning, tubing replacement, or larger scale O&M activities that may result in extended system downtime.

2.3 System Downtime

By design, the recovery systems are programmed for intermittent pumping. This allows for DNAPL to pool and collect to levels that can be recovered by the extraction systems. The system at the WAC property is programmed to pump every 2 days. Historically, the system at the Nyacol property has been programmed to pump at the limit of the pump controller (every 4 days) due to decreased DNAPL production at this location; however, based on conversations with EPA, Nyacol was programmed to pump at the same frequency as the WAC system (every 2 days) to increase contaminated water recovery during most of the current reporting period. However, EPA and Nobis agreed to return to manual pumping only at Nyacol, because little or no DNAPL was recovered during automatic pumping cycles in the current reporting period. Automatic pumping at Nyacol was shut off on August 3, 2017. Current pump settings trigger between five to seven pumping cycles per automatic pumping event at WAC and at Nyacol prior to the change to manual pumping only.

Table 2-1 and Table 2-2 summarize problems encountered during the performance period at the WAC and Nyacol pumping systems, respectively, and corrections made to resolve the issues.

Some of these system problems resulted in periods of downtime of a few days or more. Significant system problems and remedies are summarized below:

- Stuck "Tank Full Error" During System Restart, Nyacol System – Nobis took this system off-line in December, 2015 to allow DNAPL to pool. During this downtime, Nobis removed the Nyacol system controller (August, 2016) and installed at the WAC system to immediately return the WAC system to service when that system's controller malfunctioned. On September 7, 2016, Nobis installed a replacement controller to return the system to automated pumping for the first time since automated pumping was suspended. During installation, the replacement controller continuously displayed "Tank Full Error" and could not be enabled. Nobis corresponded with AquaRep (maintenance subcontractor) and QED (controller manufacturer) in the field to remedy the situation; however, it was determined that a replacement controller was needed. Nobis returned the defective controller to the manufacturer and Nobis installed the new controller on September 14, 2016 effectively bringing the system back on-line for the first time since December 2015. At the request of EPA (Dan Keefe), Nobis programmed the system at re-start to pump as frequently as the WAC system (every 48 hours instead of at the limit of the controller timing as done previously) to continue with contaminated water recovery. This automatic pumping continued until August 3, 2017, when Nyacol was returned to manual pumping, per discussion with EPA.

- Erroneous "Tank Full" Errors, Both Systems – The WAC and Nyacol systems encountered one "tank full" condition causing system shut down on December 23, 2016 and June 6, 2017, respectively; however, the collection tanks were not full and did not warrant system shutdown. These periodic system errors continue to challenge system operation. Although the number of "tank full" error occurrences have been greatly reduced since the last POP, testing and troubleshooting has still not identified the cause of the issue. Assumed causes for erroneous "tank full" conditions include freezing temperatures during winter operations and possible power surges. Resetting the pump controller removes the "tank full" condition and returns the systems to operation.

- Shed Heater Thermostat Malfunction, Nyacol System – On November 22, 2016, Nobis noted loud buzzing emitting from the thermostat control box and that the heater was not working. Water had infiltrated into thermostat enclosure and shorted out the magnetic contactor. AquaRep replaced the magnetic contactor on December 8, 2017 and reconfigured the mount to eliminate improper penetrations through the back of the thermostat enclosure. Former penetrations were sealed to prevent further water infiltration.

- Lazy Pumping/Slow System Activation, Nyacol System – Slow system activation was noted during system O&M activities on February 10, 2017. Likely caused by cold temperatures, the system did not immediately activate when manually triggered. This condition remedied itself when manual pumping was triggered later that afternoon.

- Uncertain DNAPL Accumulation, WAC System – Nobis frequently observes slugs of DNAPL in the system tubing while pumping; however, DNAPL levels recorded during recent tank gauging do not correlate with levels of DNAPL observed. It continues to prove challenging to gauge DNAPL levels because the DNAPL components do not tend to interact with an oil/water interface probe, and bailers have met limited success in capturing in-tank DNAPL for measurements. Nobis continues to research indicator paste and other solutions that may help with more accurate DNAPL gauging/level calculations.

- Ant Infestation, WAC System – On June 6, 2017, Nobis discovered that the WAC system controller and associated housing were infested with ants. Due to the sensitive nature of the controller components, Nobis evicted the ants and removed the nest using compressed air cans designed for cleaning computer keyboards. Nobis also deployed ant bait/poison to try and eliminate the ants if they returned. During the June 27, 2017 O&M visit Nobis observed that the ant infestation inside C100 controller and control box enclosure had returned. Nobis evicted ants using an electric compressor, sealed visible controller box openings with caulking, and redeployed ant poison in and around the controller box. Nobis did not encounter further instances of ant infestation.

- High-High Float Switch Malfunction, WAC System – On August 3, 2017, the WAC autodialer notified Nobis of a “tank full” condition while performing system O&M; however, the tank was not full. System troubleshooting led to the discovery that the retainer clips designed to align the float switch with the switch internal sensor had become dislodged, causing improper sensor seating and the resulting alarm condition. Although this alarm condition could be overridden, Nobis opted to take the system off-line as a precaution, since the liquid volume in the tank was approaching the float switch levels (the collection tank was almost full). On August 17, 2017, Nobis re-seated the float using zip-ties so that it would align with the switch sensor, essentially fixing the problem. Nobis was unable to find replacement clips since the installed sensor model is no longer manufactured. Nobis continues to try to source the proper replacement parts; however, the zip-tie repair is likely an adequate solution to the problem.

- Uncertain DNAPL Accumulation and Recovery, Nyacol System – Nobis last observed DNAPL while pumping at Nyacol on September 14, 2016, when Nobis reinstated automated pumping at the Site after a long period of being off-line (the Nyacol system was off-line since February 17, 2016 to allow DNAPL to pool). At the request of EPA, Nobis programmed the system at re-start to pump as frequently as the WAC system (every 48 hours) to continue with contaminated water recovery. Free-phase DNAPL was observed during system restart; however, Nobis observed the typical DNAPL/water emulsion during subsequent pumping. Based on conversations with EPA, Nobis has again disabled the system (on August 3, 2017) for an extended period (duration to be determined) to allow DNAPL to pool. Alarm histories downloaded from each of the autodialers are included as Appendix F; however, most autodialer alarms recorded during the POP resulted from manually tripping alarm conditions during system testing or alarm conditions triggered to test autodialer notification system settings.

3.0 OPERATIONAL MONITORING DATA

Operational data is recorded on O&M site visit forms and in a field book dedicated to O&M activities. Electronic versions of O&M records are generated for each O&M visit and stored in electronic job files on Nobis' server. Original site visit forms are stored in a three-ring binder. Operational records generated during O&M activities serve the following purposes:

- Provide a running account of the DNAPL Extraction System operation;
- Document O&M procedures and serve as evidence of actual O&M events that occurred;
- Provide a record of compliance with performance requirements;
- Log data to evaluate system operation and to interpret system performance;
- Note when system service was last performed and track service intervals; and
- Provide a basis for the design of future modifications or expansions of the DNAPL Extraction System.

Nobis recorded system operating conditions upon arrival and departure. This allows for accurate documentation of the condition of the system upon arrival and whether the technician left the system enabled at departure.

Nobis incorporated the suggested recommendations included in the 2016 O&M report to better track system performance, improve problem identification, and increase system reliability. Nobis used the revised O&M Site Visit Form to better track system conditions to provide more efficient data and condition reporting. No data tracking or form revisions are proposed in this O&M report.

O&M records are available to operations personnel for reference and use. Complete O&M records can be provided to EPA upon request.

3.1 DNAPL Analytical Data

EPA contractors have collected DNAPL samples for laboratory analysis since 2001. Arthur D. Little analyzed DNAPL from MW-113A during Fall 2001. Nobis analyzed DNAPL from MW-113A in 2012, 2015, 2016, and 2017 for fingerprint analysis and for waste characterization in 2014. Nobis submitted a DNAPL Evaluation Report to EPA in 2013.

Table 3-1 presents the 2016 and 2017 DNAPL fingerprint analysis results. Table 3-3 summarizes the percentages of the primary DNAPL components in historical DNAPL samples collected from MW-113A. DNAPL sampling data from MW-113A since 2001 indicate the following:

- The 2012 and 2016 DNAPL samples are inconsistent with the other three samples collected at the Site. Data trends for all but those samples reveals the following:
    - The percent concentrations of 1,4-DCB, 1,2,4-TCB, chlorobenzene, and nitrobenzene have decreased from 2001 to 2015.
    - The 1,2-DCB concentration has remained relatively consistent since 2001.
    - The 1,4-DCB concentration has remained relatively consistent since 2014.
    - TCE concentrations have shown a recent decline in 2017.
    - The percent concentration of 1,3-DCB has increased since 2001, specifically recently in 2017.

- Total percentages of listed compounds have increased in 2017, most likely due to the large increase of 1,3-DCB detected in the 2017 sample.

Based on limited DNAPL sampling, the reduction in many DNAPL constituents is likely due to degradation and/or dilution at MW-113A. Based on DNAPL gauging data at other locations (e.g., MW/B-11, RW-1, and SB-600), DNAPL is no longer present at some locations where evidence of DNAPL was once observed.

Nobis did not observe free phase product while pumping MW/B-11 or in the collection tank at this location aside from DNAPL slugs observed during system restart in September 2016, after a long period of system shutdown to allow DNAPL to pool in the well. In general, free phase DNAPL is only present in MW-113A; however, DNAPL is likely present at other locations where monitoring wells have not yet intersected fractures that may contain free-phase product.

3.2 O&M Data Presentation

Pump controller settings trigger pumping cycles every 48 hours at Nyacol and WAC during most of the current reporting period. Pump controller settings (refill, discharge, and pump on times) determine how many times the pump activates during each pumping cycle. Periodically, pump controller settings are changed to maximize DNAPL recovery or lessen excess water collection. During winter months, pump discharge cycles are increased to purge water from the line at the end of the pumping cycle to help prevent tubing freezing.

O&M data used to track system performance for the WAC and Nyacol pumping systems are presented in Tables 4-1 and 4-2, respectively. These tables present recorded data collected during O&M site visits. Data includes:

- Pump “on time” (actual time the pump is displacing liquid);
- Volume of liquid in the collection tanks;
- Nitrogen gas consumption; and
- PID screening values at influent/effluent ports for the vapor drums (to track carbon breakthrough).

Tables 4-3 and 4-4 present system totals such as days in operation, days offline, total time, and total gallons pumped for the POP. Table 4-5 compares totals for both WAC and Nyacol since system start-up. Findings and system evaluation are presented in Section 5 below.

3.3 Utilities, Consumables, and Waste Handling/Disposal

3.3.1 Utilities

Electrical power and phone service are the only utilities used to operate the recovery systems. Solar panels installed at Nyacol help to off-set power consumption; however, the WAC system location does not support the use of solar power (area is too wooded). Electricity is used to power system enclosure lights, fans, and heaters and system components such as pump controllers and autodialers. Phone service allows the autodialers to contact personnel in the event of a system emergency.

WAC has an electrical meter installed that displays electrical consumption in kilowatt hours (KWH). The Nyacol system does not have an electrical meter. WAC has consumed 6,062 KWH of electricity during the tracked period (September 1, 2017 through August 31, 2017).

3.3.2 Consumables

Consumables include nitrogen gas used to power the recovery pumps, granular activated carbon (GAC) used to treat storage tank vapors, personal protective equipment (PPE), and other supplies (cleaners, respirator cartridges, etc.) used during O&M activities.

High pressure (2500 psi) nitrogen tanks with a capacity of 304 cubic feet provide pneumatic power to the recovery pumps. Nobis replaced the nitrogen tanks one time at each facility during the POP. Previous leaks in the nitrogen system that contributed to excessive nitrogen use have been remedied. Under normal pumping conditions, a single nitrogen tank at each pumping station is sufficient for the POP.

New Bedford Welding Supply delivered two replacement nitrogen cylinders to replenish the nitrogen gas supply on September 14, 2016.

3.3.3 Waste Handling/Disposal

Wastes generated during system operations include recovered liquid collected in the storage tanks, GAC used to treat DNAPL vapors, and spent/contaminated PPE and other materials generated during O&M activities.

Recovered Liquid

Liquid in storage tanks at each location was removed and disposed of once during the POP, as pumping on the current schedule fills the collection tank at WAC approximately annually. New England Disposal Technologies Inc. (NEDT) pumped out the collection tanks and transported the contents under a hazardous waste manifest to Clean Harbors Environmental Services, Inc.'s (Clean Harbors) disposal facility in Braintree, Massachusetts.

Tank pump-outs are performed when the storage tanks become nearly full. Generally, WAC pumps more frequently than Nyacol; therefore, the WAC tank fills more rapidly. Both system tanks are pumped during the same event to meet minimum disposal volumes required by the hazardous waste subcontractor.

Two-hundred and seven (207) and 399 gallons of liquid collected from both systems was disposed of on January 16, 2017 and August 17, 2017, respectively. Previous tank pump-outs were performed in May 2014, 2015, and 2016. More efficient pumping and less system downtime have allowed for the tank to fill multiple times during this POP. The waste manifest is included as Appendix G.

There is a discrepancy between the amount of liquid calculated in the tank by Nobis and the amount of liquid reportedly removed by the hazardous waste hauler. The difference is as follows:

<table>
<tr><th>Facility</th><th>Date</th><th>NEDT Volume (gal)</th><th>Nobis Volume (gal)</th><th>Difference</th></tr>
<tr><td rowspan="2">WAC</td><td>1/16/2017</td><td>207</td><td>205</td><td>2</td></tr>
<tr><td rowspan="2">8/17/2017</td><td>242</td><td>207</td><td>35</td></tr>
<tr><td>Nyacol</td><td>157</td><td>147</td><td>10</td></tr>
<tr><td colspan="2">Total</td><td>606</td><td>559</td><td>47</td></tr>
</table>

These differences are likely attributed to measurement errors associated with the methods in which the volumes were calculated by both NEDT and Nobis. Nobis uses a non-graduated sight glass with hand written reference marks to gauge tank contents. Tank volume is calculated from sight glass readings using tank geometry (Nobis calculated 5.35 gallons of liquid per foot in the storage tanks).

NEDT calculated recovered volumes by measuring the contents of the truck tank using a tank stick and conversion chart. In both instances, NEDT's truck arrived "empty"; however, the driver was uncertain if residual liquid was present in the tank before the pump out was performed. It can also be difficult to accurately measure low liquid volumes in large, rounded tanks using a tank stick.

Nobis relied on our tank gauging data to track tank volumes for the purposes of this report. This NEDT discrepancy is inconsequential because of minimum volume requirements for disposal fees, as both the Nobis and NEDT liquid volumes were below the 400-gallon minimum set by the disposal company.

Granular Activated Carbon Vapor Drums

One 55-gallon drum of GAC is located in each system enclosure. GAC is used to treat storage tank vapors before they are vented through a stack to the atmosphere. Nobis tracks GAC breakthrough by screening vapor concentrations with a PID both before and after the GAC drum.

System specifications indicate that breakthrough has occurred when effluent concentrations reach 25 parts per million (ppm). Carbon drums have not yet required replacement; maximum effluent concentrations during the POP were 0.4 ppm for both systems. Historical maximum screening values have been 3.3 and 3.7 ppm at WAC and Nyacol, respectively.

55-gallon Remediation Waste Drums

Each system has 55-gallon drums for the collection investigation derived waste (IDW) that includes spent PPE and other materials generated by O&M activities. Nobis recently consolidated IDW generated since systems start-up into two drums, both now located at the WAC facility. One empty drum remains at each facility for the future collection of IDW.

To save on disposal costs, Nobis will dispose of these drums when all four drums become full. Since two drums remain empty, remediation waste drums have not yet required disposal or replacement.

3.3.4 Cost Summary

A summary of costs incurred to operate and maintain both recovery systems over the POP is as follows:

Nobis	
Labor	$ 57,257.58.
Travel	$1,151.23
Materials, Supplies, and Equipment	$141.41
Reporting, Signage, Reproduction	$98.56
Subtotal	$58,648.78
Subcontractor Costs	
PPE, Monitoring Equipment	$1,795.00
Snow Removal	$0.00
Liquid Trans and Disposal	$5,500.00
Repairs	$1,017.23.64
Laboratory	$1,405.40
Subtotal	$9,717.63
Systems Operations	
Power	$0.00
Nitrogen Tanks - Rental and Material	$229.34
Subtotal	$229.34
Grand Total	$68,595.75

4.0 OPERATIONAL FINDINGS

Operational findings are as follows:

- Historically, DNAPL has been observed at both the Nyacol and WAC facilities. Free-phase product is often observed at WAC, while a DNAPL/water emulsion is usually present at

Nyacol. DNAPL (free phase product) is no longer detected in RW-1, MW/B-5, and SB-600. Extraction system operation has reduced DNAPL volume in MW/B-11.

- The Nyacol system was off-line at the beginning of the POP to allow for DNAPL to collect in the well. At the request of EPA, pumping frequency was set as the same as WAC (every 48 hours) instead of at the limits of the pump controller (every 100 hours) as done previously). The Nyacol system was also off-line at the end of the POP, following cessation of automatic pumping on August 3, 2017.

- Previous tank gauging and historical data support the estimate that 20 percent of the liquid recovered at WAC is free-phase DNAPL. Tank gauging and DNAPL measurements conducted during the first half of the POP support this estimate; however, recent DNAPL measurements have indicated a reduction in the ratio of DNAPL to water in the collection tank. Nobis is unsure if this reduction is actual or if it is a result of the difficulty in gauging DNAPL due to its physical characteristics. Interface probes do not respond well to the DNAPL, and bailer check valves have problems sealing when encountering DNAPL. For the purposes of this report, Nobis continued to use the 20% estimate, specifically since difficulty gauging DNAPL has come to light during recent gauging events. Nobis will evaluate alternate DNAPL gauging methods and if needed, change the DNAPL percent estimate to reflect gauging findings during the next POP.

- As stated above, recovered liquid at Nyacol takes the form of a DNAPL/water emulsion. Through observations and jar testing (testing to see if free-phase product is present at Nyacol), no clear separation between the DNAPL and water has been identified. Approximately 55% of the recovered liquid at Nyacol is DNAPL/water emulsion. The portion of this emulsion that is DNAPL is unknown.

- Four-hundred and forty-nine (449) gallons of liquid has been collected at WAC, resulting in the recovery of approximately 90 gallons of DNAPL during the POP. One hundred and fifty-seven (157) gallons of liquid and approximately 86 gallons of a DNAPL/water emulsion were recovered at Nyacol during the POP. Since recovery started in 2013, approximately 200 gallons of DNAPL have been removed from the formation at the WAC location. Approximately 233 gallons of DNAPL/water emulsion have been collected at Nyacol.

- Both the Nyacol and WAC systems each used one cylinder of nitrogen gas to power the pump over the POP. A total of 15 cylinders of nitrogen have been consumed since system start up, consisting of four used at WAC and 11 used at Nyacol. Recent changes to how nitrogen consumption is tracked allows for Nobis to more effectively identify leaks in the nitrogen system, resulting in better nitrogen conservation at both systems.

- PID screening across the vapor drums indicates that carbon treatment of DNAPL vapors remains effective at both locations. Carbon vapor drums have not yet needed to be replaced at either system. Maximum effluent concentrations have not approached the breakthrough value of 25 ppm at either system.

- One 55-gallon drum of remediation waste (PPE, cleaning products, containers, etc.) has been generated at each recovery system since system start-up. Repacking and waste management throughout this POP has prevented the need for additional drums at each location. Full drums have been consolidated and are stored at the WAC site until the remaining drums are filled (one at each site) and drum pick-up and disposal is warranted.

- Better data recording through revised and additional site visit forms has increased system reliability and resulted in more efficient performance data presentations.

- Nobis identified an ant infestation inside the WAC pump controller module and associated housing. Nobis removed the ant nest from the control box using an electric air compressor, sealed box penetrations using caulking, and deployed ant poison/bait traps to control the ant infestation. Ants were not observed in the controller box since these remedies were implemented.

- Nobis replaced a heater thermostat that malfunctioned due to water infiltration into the thermostat housing. This was a result of improper installation during initial construction. Thermostat replacement included correctly mounting the new thermostat and sealing former penetrations to prevent continued water infiltration into the housing.

- Many of the autodialer alarms presented in Appendix F resulted from testing during autodialer contact testing and float switch troubleshooting, and therefore are not indicative of actual alarm conditions. The systems incurred no downtime due to these conditions (aside from being manually taken off-line while troubleshooting the float malfunction at WAC).

- Two erroneous “tank full” errors, one at each facility, were noted during the POP. Both were remedied by routine activities performed during the O&M visits.

- The WAC pumping station was operational for 95% of the POP (up from 93% during the previous POP/since initiation). The Nyacol system was operational for 88% of the POP, with most of the downtime during the POP attributed to the system being off-line to allow for DNAPL to pool, not from system errors. An effective comparison for Nyacol between this POP and the last cannot be made since Nyacol was intentionally off-line for 81% of the last POP. Suspended operations at Nyacol allowed Nobis to confirm the presence of free-phase product at Nyacol, as Nobis observed slugs of DNAPL in system tubing during system re-start after 6.5 months of being off-line (last manual pumping was January 20, 2017). Automatic operations were reinstated at the Nyacol system in September 2016, and Nyacol was again converted to manual operations in August 2017 to allow DNAPL to pool to confirm if DNAPL is still present at B/MW-11. Nyacol system pumping will be reinstated, on a manual basis, at some point during the next POP.

- Both collection tanks were emptied once during the POP and the WAC system tank was emptied twice. Six-hundred and six (606) gallons of DNAPL/groundwater, collected from both systems, were disposed of at Clean Harbors in Braintree, Massachusetts.

5.0 CONCLUSIONS AND RECOMMENDATIONS

System Effectiveness Evaluation

The recovery systems have been effective at removing DNAPL pools from groundwater in the shallow bedrock at both system locations; however, the WAC recovery system is more effective than the Nyacol recovery system, mostly because data shows that more free-phase product is present at WAC (as an emulsion is recovered from Nyacol).

The reliability of the WAC system has increased in 2017, up 2% since the last POP. Nobis has increased efficiency by managing system equipment shortfalls such as equipment malfunctions, erroneous “tank full” errors, and pumping inefficiencies through system modifications and equipment troubleshooting and repair. An increase or decrease in efficiency at Nyacol cannot be calculated due to the long period of intentional downtime at Nyacol during the last POP.

Recommendations

Nobis recommends continuing with DNAPL recovery, as the systems have been effective at removing DNAPL. DNAPL (free phase product) is no longer detected in RW-1, MW/B-5, and SB-600. Extraction system operation has reduced DNAPL volume in MW/B-11.

Suggested System/Monitoring Modifications

Nobis recommends suspending automatic pumping at the Nyacol system to allow for DNAPL to pool at this location. Recovery at the Nyacol system was suspended on August 3, 2017. Nobis will periodically manually pump the system to visually track DNAPL recovery. Nobis will correspond with EPA to determine if and when to return the system to automated pumping.

Recent DNAPL gauging has proved to be challenging to obtain accurate measurements of DNAPL accumulated in the collection tanks. Nobis will research and implement alternate DNAPL gauging methods to allow for better measurements of collected DNAPL volumes.

6.0 REFERENCES

Nobis Engineering, Inc., 2010. Technical Memorandum for Step Drilling Program (WAC), Nyanza Chemical Waste Dump – Operable Unit 2, Ashland Massachusetts. January.

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Nobis Engineering, Inc., 2014. DNAPL Operations and Maintenance Plan, Nyanza Chemical Waste Dump – Operable Unit 2, Ashland Massachusetts. April.

Nobis Engineering, Inc., 2015. DNAPL Extraction System Operations and Maintenance Report Nyanza Chemical Waste Dump Superfund Site – Operable Unit 2, Nyanza Chemical Waste Dump – Operable Unit 2, Ashland Massachusetts. December.

U.S. EPA, 1991. Declaration for the Record of Decision: Nyanza Chemical Waste Dump Superfund Site, Operable Unit II. September.

U.S. EPA, 2006. Explanation of Significant Differences for the Nyanza Chemical Waste Dump Superfund Site (Operable Unit 2), Ashland, Massachusetts. September.

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Table 2-1
WAC System Problems Encountered During the Performance Period
Nyanza Chemical Waste Dump Superfund Site
Ashland, Massachusetts

Date Discovered	Summary of Problem	Remedy	Downtime (Days)
12/23/2016	System disabled due to a "Tank-Full" error, no alarm sent by autodialer.	Condition discovered upon arrival for O&M visit. System reactivated during visit.	Unknown < 15
3/29/2017	Inconsistent DNAPL Gauging		0
6/6/2017	Ant infestation within controller.	Ant infestation inside C100 controller and control box enclosure. Nobis evicted ants using compressed air canisters (computer keyboard cleaner style) and placed ant poison in and around the controller box.	0
6/27/2017	Ant infestation within controller.	Ant infestation inside C100 controller and control box enclosure returned. Nobis evicted ants using air from an electric compressor, sealed visible controller box openings with caulking, and redeployed ant poison in and around the controller box. No further instances of ant infestation encountered.	0
8/3/2017	Level Switch High High Malfunction - Mounting clip for float/sensor dislodged creating an alarm condition.	Float switches in recovery tank re-alinged with switch sensors.	13
		Total Downtime Days	20

Note:

System components report system shut down due to conditions such as low battery, no power, and actual tank full conditions; however, system components are unable to report when a system goes off-line due to conditions such as freezing or erroneous tank full alarms. Nobis used half of the duration between site visits to estimate system down time when a previously enabled system was found to be off-line upon return.

Table 2-2
Nyacol System Problems Encountered During the Performance Period
Nyanza Chemical Waste Dump Superfund Site
Ashland, Massachusetts

Date Discovered	Summary of Problem	Remedy	Downtime (Days)
9/7/2016	Controller stuck with "Tank Full Error" during system re-enabling.	Controller returned to manufacturer and replacement sent. New controller installed on 9/14/17 and system brought back on-line for the first time since 12/2015. Pumping frequency set as the same intervals as WAC as per D. Keefe. DNAPL observed during initial pumping.	7
11/22/2016	Shed heater thermostat malfunction - Water infiltration into thermostat enclosure (due to improper installation during initial system construction) shorted out the magnetic contactor.	Heater magnetic contactor replaced by Aquarep on 12/8/2017. Contactor mount reconfigured so holes no longer protruded through the enclosure and penetrations through the thermostat enclosure sealed/repaired to prevent further water infiltration.	0
2/10/2017	Lazy pumping - system wont activate when enabled	Unknown remedy - system opeated fine when revisisted later in the day.	0
6/6/2017	System disabled due to a "Tank-Full" error, no alarm sent by autodialer.	Condition discovered upon arrival for O&M visit. System reactivated during visit.	Unknown < 15
8/3/2017	Minimal DNAPL purged	System disabled to allow DNAPL pooling and efficient recovery.	28
		Total Downtime Days:	42

Note:
Nobis periodically manually activated the recovery system during the extended period of Nyacol deactivation to continue to monitor DNAPL accumulation while the system was off-line.

Table 3-1
2017 DNAPL Analytical Data
Nyanza Chemical Waste Dump Superfund Site
Ashland, Massachusetts
Page 1 of 2

Field Sample ID	NYACOL-062717	WAC-062717
Sample Date	07/06/17	06/27/17
Volatiles	**ug/L**	**mg/kg**
1,1,1,2-Tetrachloroethane	1 U	1300 U
1,1,1-Trichloroethane	1 U	1300 U
1,1,2,2-Tetrachloroethane	0.5 U	630 U
1,1,2-Trichloroethane	1 U	1300 U
1,1-Dichloroethane	1 U	1300 U
1,1-Dichloroethene	1 U	1300 U
1,1-Dichloropropene	0.5 U	2500 U
1,2,3-Trichlorobenzene	2 UJ	5100 UJ
1,2,3-Trichloropropane	2 U	2500 U
1,2,4-Trichlorobenzene	6.1 J+	3400 J+
1,2,4-Trimethylbenzene	1 U	1300 U
1,2-Dibromo-3-chloropropane	2 U	5100 U
1,2-Dibromoethane	0.5 U	630 U
1,2-Dichlorobenzene	160	130000
1,2-Dichloroethane	2 U	2500 U
1,2-Dichloropropane	1 U	1300 U
1,3,5-Trimethylbenzene	1 U	1300 U
1,3-Dichlorobenzene	14	4600
1,3-Dichloropropane	0.5 U	630 U
1,4-Dichlorobenzene	43	25000
1,4-Dioxane	50 R	63000 R
2,2-Dichloropropane	1 U	1300 U
2-Butanone	10 U	25000 U
2-Chlorotoluene	1 U	1300 U
2-Hexanone	10 U	13000 U
4-Chlorotoluene	1 U	1300 U
4-Isopropyltoluene	1 U	1300 U
4-Methyl-2-pentanone	10 U	13000 U
Acetone	10 U	63000 U
Benzene	1 U	1300 U
Bromobenzene	1 U	1300 U
Bromochloromethane	1 U	1300 U
Bromodichloromethane	1 U	1300 U
Bromoform	2 U	2500 U
Bromomethane	2 UJ	2500 UJ
Carbon disulfide	5 U	13000 U
Carbon tetrachloride	1 U	1300 U
Chlorobenzene	190	31000
Chloroethane	2 U	2500 U
Chloroform	2 U	2500 U

Field Sample ID	NYACOL-062717	WAC-062717
Sample Date	07/06/17	06/27/17
Volatiles	**ug/L**	**mg/kg**
Chloromethane	2 U	2500 U
cis-1,2-Dichloroethene	26	1300 U
cis-1,3-Dichloropropene	0.4 U	630 U
Dibromochloromethane	0.5 U	630 U
Dibromomethane	1 U	1300 U
Dichlorodifluoromethane	2 UJ	2500 UJ
Diethyl ether	2 U	2500 U
Diisopropyl Ether	0.5 U	630 U
Ethylbenzene	1 U	1300 U
Hexachlorobutadiene	0.6 U	1300 U
Isopropylbenzene	1 U	1300 U
m,p-Xylene	2 U	2500 U
Methyl tert-butyl ether	1 U	1300 U
Methylene chloride	5 U	6300 U
Naphthalene	2 U	2500 U
n-Butylbenzene	1 U	1300 U
n-Propylbenzene	1 U	1300 U
o-Xylene	1 U	1300 U
sec-Butylbenzene	1 U	1300 U
Styrene	1 U	1300 U
tert-Amyl methyl ether	0.5 U	630 U
Tert-Butyl Ethyl Ether	0.5 U	630 U
tert-Butylbenzene	1 U	1300 U
Tetrachloroethene	1 U	1300 U
Tetrahydrofuran	5 U	6300 U
Toluene	1 U	1300 U
trans-1,2-Dichloroethene	1.4	1300 U
trans-1,3-Dichloropropene	0.4 U	630 U
Trichloroethene	78	12000
Trichlorofluoromethane	2 U	2500 U
Vinyl chloride	2 U	2500 U

Notes:
1. Units as listed at top of columns
2. U – not detected
3. J – estimated value
4. UJ – not detected, reporting limit estimated
5. R – rejected

Table 3-1
2017 DNAPL Analytical Data
Nyanza Chemical Waste Dump Superfund Site
Ashland, Massachusetts

Field Sample ID	NYACOL-062717	WAC-062717
Sample Date	07/06/17	06/27/17
Field Sample ID	NYACOL-062717	WAC-062717
Sample Date	07/06/17	06/27/17
Semivolatiles	**ug/L**	**mg/kg**
1,2,4-Trichlorobenzene	22	10000
1,2-Dichlorobenzene	1400	300000
1,2-Diphenylhydrazine	40 U	0.34 U
1,3-Dichlorobenzene	49	13000
1,4-Dichlorobenzene	320	70000
2,4,5-Trichlorophenol	40 U	0.34 U
2,4,6-Trichlorophenol	40 U	0.34 U
2,4-Dichlorophenol	40 U	0.34 U
2,4-Dimethylphenol	40 U	0.34 U
2,4-Dinitrophenol	40 U	0.66 U
2,4-Dinitrotoluene	40 U	0.34 U
2,6-Dinitrotoluene	40 U	0.34 U
2-Chloronaphthalene	40 U	0.34 U
2-Chlorophenol	40 U	0.34 U
2-Methylnaphthalene	20 U	0.17 U
2-Methylphenol	40 U	0.34 U
2-Nitrophenol	40 U	0.34 U
3,3'-Dichlorobenzidine	40 U	0.17 U
4-Bromophenyl-phenylether	40 U	0.34 U
4-Chloroaniline	40 U	0.66 U
4-Nitrophenol	40 U	0.66 U
Acenaphthene	20 U	0.17 U
Acenaphthylene	20 U	0.17 U
Acetophenone	40 U	0.34 U
Aniline	25	0.34 UJ
Anthracene	20 U	0.17 U
Benzo(a)anthracene	20 U	0.17 U
Benzo(a)pyrene	20 U	0.17 U
Benzo(b)fluoranthene	20 U	0.17 U
Benzo(g,h,i)perylene	20 U	0.17 U
Benzo(k)fluoranthene	20 U	0.17 U
Bis(2-chloroethoxy)methane	40 U	0.34 U
Bis(2-chloroethyl)ether	40 U	0.34 U
bis-(2-chloroisopropyl)ether	40 U	0.34 U
Bis(2-ethylhexyl)phthalate	40 U	0.34 U
Butylbenzylphthalate	40 U	0.34 U
Chrysene	20 U	0.17 U
Dibenz(a,h)anthracene	20 U	0.17 U

Field Sample ID	NYACOL-062717	WAC-062717
Sample Date	07/06/17	06/27/17
Field Sample ID	NYACOL-062717	WAC-062717
Sample Date	07/06/17	06/27/17
Semivolatiles	**ug/L**	**mg/kg**
Dibenzofuran	20 U	0.34 U
Diethylphthalate	40 U	0.34 U
Dimethylphthalate	40 U	0.34 U
Di-N-Butylphthalate	40 U	0.34 U
Di-N-Octyl Phthalate	40 U	0.67 UJ
Fluoranthene	20 U	0.17 U
Fluorene	20 U	0.17 U
Hexachlorobenzene	40 U	0.34 U
Hexachlorobutadiene	40 U	0.34 U
Hexachloroethane	40 U	0.34 U
Indeno(1,2,3-cd)pyrene	20 U	0.17 U
Isophorone	40 U	0.34 U
m,p-Cresol	40 U	0.34 U
Naphthalene	20 U	0.17 U
Nitrobenzene	40 U	170000
Pentachlorophenol	40 U	0.34 U
Phenanthrene	20 U	0.17 U
Phenol	40 U	0.34 U
Pyrene	20 U	0.17 U

Notes:
1. Units as listed at top of columns
2. U – not detected
3. J – estimated value
4. UJ – not detected, reporting limit estimated
5. R – rejected

Table 3-2
MW-113A DNAPL Primary Components Summary
Nyanza Chemical Waste Dump Superfund Site
Ashland, Massachusetts

Sample Location	**MW-113A**									
Sample Date	Fall 2001	8/14/2012	3/11/2014	12/1/2015	10/4/2016	10/4/2016	10/4/2016	10/4/2016	6/27/2017 and 7/6/2017	6/27/2017
Chemical Name										
1,2,4-Trichlorobenzene	2.4	0.045	0.81	0.94	ND	ND	ND	0.0031	0.00000061	0.34
1,2-Dichlorobenzene	30.9	1.4	32	29 D	0.0078	0.0011	0.36	0.11	0.00014	30.0
1,3-Dichlorobenzene	2.8	0.074	1.45	1.2	0.0003	ND	ND	0.0044	0.0000049	13.0
1,4-Dichlorobenzene	10.6	0.33	7.3	6.2 D	0.0017	0.0003	0.076	0.024	0.000032	7.0
Chlorobenzene	10.3	0.39	9.6	7.7 D	0.0011	0.0005	0.061	0.034	0.000019	3.1
Nitrobenzene	28	22 J	21	16 J	ND	ND	22	9.2	ND	17
Trichloroethene	3.5	0.27	5.3	4.5 D	ND	ND	ND	0.025	0.0000078	1.2
Total:	88.5	24.5	77.5	65.5	0.0109	0.0019	22.497	9.4	0.00020431	71.6

Notes:
1. All values are in percent (%)
2. Fall 2001 sample data from Table 2-2, ICF Consulting, 2006. Final DNAPL Alternatives Memorandum
3. J = estimated value
4. D = value from dilution

Table 4-1
WAC Recovery System O&M Data
Nyanza Chemical Waste Dump Superfund Site
Ashland, Massachusetts

CALENDAR			DISCHARGE (PUMPING) TIME (hr:min:sec)						LIQUID (Gallons)				PID SCREENING (PPM)		
DATE	System Operational Days	Days since previous reading	ARRIVAL METER READING	DEPARTURE METER READING	TOTAL DURING O&M VISIT	TOTAL SINCE LAST DEPARTURE (automated pumping)	TOTAL SINCE LAST O&M VISIT (arrival to arrival)	TOTAL SINCE START	CALCULATED VOLUME ON ARRIVAL	CALCULATED VOLUME ON DEPARTURE	TOTAL GALLONS PUMPED SINCE LAST O&M VISIT	DRAWDOWN CALCULATION (ft)	ROOM	CARBON DRUM INLET	CARBON DRUM OUTLET
9/11/13	0	0	0:00:00				--	0:00:00	--	BSG	UNK	--	0.0	--	--
9/13/2013	2	2	0:31:00				0:31:00	0:31:00	--	BSG	UNK	--	0.0	2568.0	2.2
9/16/2013	5	3	0:38:56				0:07:56	0:38:56	--	BSG	UNK	--	--	--	--
9/18/2013	7	2	0:43:28				0:04:32	0:43:28	--	BSG	UNK	--	0.0	4050.0	0.4
9/25/2013	14	7	0:59:20				0:15:52	0:59:20	--	BSG	UNK	--	0.0	4600.0	0.0
10/2/2013	21	7	1:08:24				0:09:04	1:08:24	--	47.5	47.5	--	0.3	OR (>15000)	1.6
10/3/2013	22	1	1:11:45				0:03:21	1:11:45	--	50.8	3.3	--	0.4	--	--
10/4/2013	23	1	1:16:48				0:05:03	1:16:48	--	53.5	2.7	--	0.2	--	--
10/9/2013	28	5	1:23:24				0:06:36	1:23:24	--	55.5	2.0	--	0.6	9600.0	1.4
10/16/2013	35	7	1:32:28				0:09:04	1:32:28	--	62.2	6.7	--	0.2	1500.0	1.3
10/23/2013	42	7	1:36:52				0:04:24	1:36:52	--	63.5	1.3	--	0.1	4000.0	3.3
10/28/2013	47	5	1:39:02				0:02:10	1:39:02	--	64.2	0.7	--	0.6	--	1.5
10/30/2013	49	2	1:50:28				0:11:26	1:50:28	--	84.7	20.5	--	0.0	3400.0	0.1
11/6/2013	56	7	1:56:22				0:05:54	1:56:22	--	88.6	3.9	0.35	0.0	OR (>9999)	0.0
11/12/2013	62	6	--				--	--	--	--	--	--	--	--	--
11/18/2013	68	6	2:19:04				0:22:42	2:19:04	--	105.0	16.4	--	0.2	--	--
11/27/2013	77	9	2:27:04				0:08:00	2:27:04	--	108.3	3.3	--	0.0	--	--
12/4/2013	84	7	2:35:04				0:08:00	2:35:04	--	113.0	4.7	--	0.0	--	0.4
12/12/2013	92	8	--				--	--	--	114.4	1.3	--	--	--	--
12/18/2013	98	6	2:48:08				0:13:04	2:48:08	--	115.0	0.6	--	--	--	--
12/20/2013	100	2	2:48:08				0:00:00	2:48:08	--	--	--	--	--	--	--
1/6/2014	117	17	2:50:48				0:02:40	2:50:48	--	115.0	0.0	--	0.0	--	0.6
1/15/2014	126	9	2:59:04				0:08:16	2:59:04	--	119.7	4.7	--	0.0	--	1.0
1/23/2014	134	8	0:04:00				0:04:00	3:03:04	--	121.0	1.3	--	--	--	0.4
1/29/2014	140	6	--				--	--	--	--	--	--	--	--	--
2/4/2014	146	6	0:09:49				0:09:49	3:12:53	--	122.7	1.7	--	0.1	1511.0	3.3
2/12/2014	154	8	0:15:09				0:05:20	3:18:13	--	123.7	1.0	--	0.0	--	0.0
2/24/2014	166	12	0:15:56				0:00:47	3:19:00	--	126.4	2.7	--	0.4	--	0.8
3/6/2014	176	10	0:25:16				0:09:20	3:28:20	--	127.4	1.0	--	0.0	--	0.5
3/11/2014	181	5	0:25:16				0:00:00	3:28:20	--	129.7	2.3	--	0.5	OVER 500	0.7
3/19/2014	189	8	0:33:56				0:08:40	3:37:00	--	132.4	2.7	--	0.0	OVER 1000	1.3
3/27/2014	197	8	0:43:56				0:10:00	3:47:00	--	ER	UNK	--	0.0	--	0.1
4/3/2014	204	7	0:51:56				0:08:00	3:55:00	--	159.2	26.7	--	0.0	--	0.1
4/8/2014	209	5	0:57:56				0:06:00	4:01:00	--	168.5	9.3	--	0.0	--	0.0
4/18/2014	219	10	1:13:56				0:16:00	4:17:00	--	181.2	12.7	--	0.0	--	0.0
4/23/2014	224	5	1:19:56				0:06:00	4:23:00	--	187.3	6.0	--	0.0	--	0.0
4/30/2014	231	7	1:27:56				0:08:00	4:31:00	--	195.9	8.7	--	0.0	--	0.1

CALENDAR			DISCHARGE (PUMPING) TIME (hr:min:sec)						LIQUID (Gallons)				PID SCREENING (PPM)		
DATE	System Operational Days	Days since previous reading	ARRIVAL METER READING	DEPARTURE METER READING	TOTAL DURING O&M VISIT	TOTAL SINCE LAST DEPARTURE (automated pumping)	TOTAL SINCE LAST O&M VISIT (arrival to arrival)	TOTAL SINCE START	CALCULATED VOLUME ON ARRIVAL	CALCULATED VOLUME ON DEPARTURE	TOTAL GALLONS PUMPED SINCE LAST O&M VISIT	DRAWDOWN CALCULATION (ft)	ROOM	CARBON DRUM INLET	CARBON DRUM OUTLET
5/7/2014	238	7	1:35:56				0:08:00	4:39:00	--	204.6	8.7	--	0.0	--	0.0
5/14/2014	245	7	--				--	--	--	--	--	--	--	--	--
5/23/2014	254	9	--				--	--	--	--	--	--	--	--	--
5/29/2014	260	6	1:37:56				0:02:00	4:41:00	--	0.0	0.0	--	0.0	--	0.3
6/4/2014	266	6	1:45:56				0:08:00	4:49:00	--	BSG	UNK	--	0.0	--	0.0
6/12/2014	274	8	1:55:56				0:10:00	4:59:00	--	BSG	UNK	--	0.0	--	0.0
6/18/2014	280	6	2:03:56				0:08:00	5:07:00	--	BSG	UNK	--	0.0	--	0.0
6/25/2014	287	7	2:09:56				0:06:00	5:13:00	--	BSG	UNK	--	0.0	--	0.0
7/2/2014	294	7	2:17:36				0:07:40	5:20:40	--	BSG	UNK	--	0.0	--	0.0
7/7/2014	299	5	2:23:56				0:06:20	5:27:00	--	49.5	49.5	--	--	--	--
7/10/2014	302	3	2:29:56				0:06:00	5:33:00	--	51.5	2.0	--	0.0	--	0.1
7/18/2014	310	8	2:36:36				0:06:40	5:39:40	--	56.2	4.7	--	0.0	--	0.3
7/23/2014	315	5	2:40:36				0:04:00	5:43:40	--	58.2	2.0	--	0.0	--	0.0
7/30/2014	322	7	2:45:56				0:05:20	5:49:00	--	61.5	3.3	--	0.0	OR (>9999)	0.0
8/8/2014	331	9	2:51:16				0:05:20	5:54:20	--	65.5	4.0	--	--	--	--
8/19/2014	342	11	3:01:56				0:10:40	6:05:00	--	70.9	5.4	--	0.1	1924.0	1.1
8/29/2014	352	10	3:12:46				0:10:50	6:15:50	--	76.2	5.3	--	0.0	OR (>9999)	0.0
9/2/2014	356	4	3:16:46				0:04:00	6:19:50	--	77.6	1.4	--	0.0	5783.0	0.3
9/9/2014	363	7	3:23:26				0:06:40	6:26:30	--	80.3	2.7	--	0.0	OR (>9999)	0.0
9/18/2014	372	9	3:30:06				0:06:40	6:33:10	--	84.3	4.1	--	0.2	OR (>9999)	0.2
9/24/2014	378	6	3:36:46				0:06:40	6:39:50	--	89.9	5.6	0.01	0.0	4985.0	0.1
10/2/2014	386	8	3:42:06				0:05:20	6:45:10	--	91.0	1.1	--	1.5	5014.0	0.0
10/8/2014	392	6	3:47:26				0:05:20	6:50:30	--	93.6	2.7	--	0.2	2520.0	0.1
10/22/2014	406	14	3:58:06				0:10:40	7:01:10	--	99.0	5.3	0.17	0.3	5890.0	0.0
11/3/2014	418	12	4:07:26				0:09:20	7:10:30	--	--	--	--	--	--	--
11/5/2014	420	2	4:10:06				0:02:40	7:13:10	--	105.7	6.7	--	0.0	OR (>9999)	0.0
11/21/2014	436	16	4:42:54				0:32:48	7:45:58	--	115.0	9.3	--	0.1	3588.0	0.0
12/1/2014	446	10	4:45:29				0:02:35	7:48:33	--	120.4	5.4	--	0.1	3190.0	0.0
12/9/2014	454	8	4:47:59				0:02:30	7:51:03	--	121.7	1.3	--	0.3	2089.0	0.3
12/16/2014	461	7	5:07:36				0:19:37	8:10:40	--	140.4	18.7	0.29	--	--	--
			0:00:02				0:00:02	8:10:42	--						
12/22/2014	467	6	0:13:16				0:13:16	8:23:58	--	144.5	4.0	--	0.0	1939.0	0.0
1/6/2015	482	15	0:17:15				0:17:15	8:41:13	--	144.5	0.0	--	0.0	--	--
1/23/2015	499	17	UNK				UNK	UNK	--	145.8	1.3	--	0.1	1728.0	0.4
			2:29:02				0:12:36	8:53:49	--						
2/3/2015	510	11	2:31:49				0:02:47	8:56:36	--	152.5	6.7	--	0.1	7385.0	0.2
2/26/2015	533	23	--				--	--	--	--	--	--	0.0	--	--
3/6/2015	541	8	2:43:49				0:12:00	9:08:36	--	**ER (122.4)**	--	--	0.0	4747.0	0.0
3/16/2015	551	10	--				--	--	--	--	--	--	0.0	--	--

CALENDAR			DISCHARGE (PUMPING) TIME (hr:min:sec)						LIQUID (Gallons)				PID SCREENING (PPM)		
DATE	System Operational Days	Days since previous reading	ARRIVAL METER READING	DEPARTURE METER READING	TOTAL DURING O&M VISIT	TOTAL SINCE LAST DEPARTURE (automated pumping)	TOTAL SINCE LAST O&M VISIT (arrival to arrival)	TOTAL SINCE START	CALCULATED VOLUME ON ARRIVAL	CALCULATED VOLUME ON DEPARTURE	TOTAL GALLONS PUMPED SINCE LAST O&M VISIT	DRAWDOWN CALCULATION (ft)	ROOM	CARBON DRUM INLET	CARBON DRUM OUTLET
4/2/2015	568	17	2:43:49				0:00:00	9:08:36	--	157.8	5.3	--	0.1	OR (>9999)	0.1
4/17/2015	583	15	2:52:04				0:08:15	9:16:51	--	162.8	5.0	--	0.0	OR (>9999)	0.0
4/28/2015	594	11	3:15:24				0:23:20	9:40:11	--	167.2	4.3	--	0.0	OR (>9999)	0.0
5/11/2015	607	13	3:15:24				0:00:00	9:40:11	--	171.2	4.0	--	0.0	2788.0	0.0
5/21/2015	617	10	3:44:25				0:29:01	10:09:12	--	181.9	10.7	--	0.3	781.0	0.0
			3:49:47				0:05:22	10:14:34	--	0.0	0.0				
5/27/2015	623	6	3:55:44				0:05:57	10:20:31	--	BSG	UNK	--	0.0	9110.0	0.0
6/12/2015	639	16	4:17:33				0:21:49	10:42:20	--	BSG	UNK	--	0.0	4899.0	0.0
6/18/2015	645	6	4:29:42				0:12:09	10:54:29	--	BSG	UNK	--	0.0	OR (>9999)	0.0
7/2/2015	659	14	4:46:30				0:16:48	11:11:17	--	BSG	UNK	--	0.0	9067.0	0.0
7/13/2015	670	11	5:03:18				0:16:48	11:28:05	--	BSG	UNK	--	0.2	OR (>9999)	0.8
7/29/2015	686	16	5:27:18				0:24:00	11:52:05	--	BSG	UNK	--	0.0	OR (>9999)	0.6
8/18/2015	706	20	5:51:18				0:24:00	12:16:05	--	BSG	UNK	--	0.0	6991.0	0.0
9/1/2015	720	14	6:12:07				0:20:49	12:36:54	--	BSG	UNK	0.24	0.0	OR (>9999)	0.2
9/15/2015	734	14	7:06:56	--	--	--	0:54:49	13:31:43	--	48.2	48.2	--	0.0	1898.0	0.5
10/1/2015	750	16	7:23:44	--	--	--	0:16:48	13:48:31	--	55.5	7.4	--	0.0	4982.0	0.4
10/13/2015	762	12	7:42:56	--	--	--	0:19:12	14:07:43	--	61.9	6.4	--	0.1	4586.0	0.2
10/29/2015	778	16	8:04:32	--	--	--	0:21:36	14:29:19	--	64.2	2.4	0.19	0.1	2392.0	0.1
11/18/2015	798	20	8:28:32	8:33:20	0:04:48	--	0:24:00	14:53:19	73.9	74.9	10.7	--	0.0	OR (>15000)	0.2
11/30/2015	810	12	8:39:02	8:43:50	0:04:48	0:05:42	0:10:30	15:03:49	76.23	76.9	2.0	--	0.0	10585.0	0.0
12/11/2015	821	11	9:12:50	9:17:38	0:04:48	0:29:00	0:33:48	15:37:37	87.9	89.3	12.4	--	--	--	--
12/22/2015	832	11	9:29:38	9:34:26	0:04:48	0:12:00	0:16:48	15:54:25	91.3	93.3	16.4	--	0.0	5745.0	0.2
1/8/2016	849	17	9:53:38	9:58:26	0:04:48	0:19:12	0:24:00	16:18:25	98.0	99.0	5.7	--	0.0	1790.0	0.1
1/20/2016	861	12	10:12:50	10:40:16	0:27:26	0:14:24	0:19:12	16:37:37	102.7	105.7	6.7	--	0.0	3426.0	0.0
2/9/2016	881	20	11:05:31	11:16:01	0:10:30	0:25:15	0:52:41	17:30:18	109.7	113.7	8.0	--	0.0	1854.0	0.0
2/17/2016	889	8	11:27:01	11:32:16	0:05:15	0:11:00	0:21:30	17:51:48	120.4	123.1	9.3	--	0.2	2778.0	0.2
3/1/2016	902	13	11:47:16	11:52:16	0:05:00	0:15:00	0:20:15	18:12:03	128.8	135.4	12.4	4.07	0.1	2337.0	0.3
3/23/2016	924	22	12:17:16	12:22:16	0:05:00	0:25:00	0:30:00	18:42:03	155.1	159.1	23.7	--	0.0	3065.0	0.2
3/30/2016	931	7	12:29:46	12:34:46	0:05:00	0:07:30	0:12:30	18:54:33	164.5	166.5	7.4	--	0.0	4188.0	0.2
4/14/2016	946	15	12:55:46	13:01:46	0:06:00	0:21:00	0:26:00	19:20:33	177.9	180.6	14.1	--	0.0	15000.0	2.3
4/28/2016	960	14	13:19:46	13:22:46	0:03:00	0:18:00	0:24:00	19:44:33	188.6	190.6	10.0	0.5	0.0	3122.0	0.0
5/11/2016	973	13	13:40:46	13:43:46	0:03:00	0:18:00	0:21:00	20:05:33	197.3	BSG	UNK	--	0.0	1916.0	0.4
5/24/2016	986	13	14:01:46	14:07:46	0:06:00	0:18:00	0:21:00	20:26:33	BSG	BSG	UNK	--	0.0	1896.0	0.0
6/7/2016	1000	14	14:25:46	14:34:46	0:09:00	0:18:00	0:24:00	20:50:33	BSG	BSG	UNK	1.42	0.0	2465.0	0.0
6/21/2016	1014	14	15:02:46	15:14:46	0:12:00	0:28:00	0:37:00	21:27:33	BSG	BSG	UNK	--	0.0	3574.0	0.8
7/8/2016	1031	17	15:38:46	15:44:49	0:06:03	0:24:00	0:36:00	22:03:33	46.81	50.82	50.82	--	0.0	1997.0	0.0
7/19/2016	1042	11	254:01:04	0:03:40	0:03:40	UNK	UNK	UNK	56.18	60.19	9.37	--	0.1	2513.0	0.0

Table 4-1
WAC Recovery System O&M Data
Nyanza Chemical Waste Dump Superfund Site
Ashland, Massachusetts

CALENDAR			DISCHARGE (PUMPING) TIME (hr:min:sec)						LIQUID (Gallons)				PID SCREENING (PPM)		
DATE	System Operational Days	Days since previous reading	ARRIVAL METER READING	DEPARTURE METER READING	TOTAL DURING O&M VISIT	TOTAL SINCE LAST DEPARTURE (automated pumping)	TOTAL SINCE LAST O&M VISIT (arrival to arrival)	TOTAL SINCE START	CALCULATED VOLUME ON ARRIVAL	CALCULATED VOLUME ON DEPARTURE	TOTAL GALLONS PUMPED SINCE LAST O&M VISIT	DRAWDOWN CALCULATION (ft)	ROOM	CARBON DRUM INLET	CARBON DRUM OUTLET
8/2/2016	1056	14	0:00:00	0:11:16	0:11:16	UNK	UNK	22:14:49	61.53	69.55	9.36	--	0.0	2287.0	0.0
8/17/2016	1071	15	0:25:56	0:33:16	0:07:20	0:14:40	0:25:56	22:40:45	72.84	74.9	5.35	--	0.0	6615.0	0.1
8/18/2016	1072	1	0:33:16	0:40:36	0:07:20	0:00:00	0:07:20	22:48:05	--	--	--	--	--	--	--
8/31/2016	1085	13	1:02:36	1:06:16	0:03:40	0:22:00	0:29:20	23:17:25	85.6	86.27	11.37	--	0.2	7500.0	0.8
9/7/2016	1092	7	1:17:16	1:24:36	0:07:20	0:11:00	0:14:40	23:32:05	--	92.28	6.01	--	--	--	--
9/14/2016	1099	7	1:35:36	1:46:36	0:11:00	0:11:00	0:18:20	23:50:25	97.64	101.65	15.38	--	0.4	2126.0	0.0
9/27/2016	1112	13	2:08:36	2:15:56	0:07:20	0:22:00	0:33:00	24:23:25	111	113.7	12.05	--	0.1	4202.0	0.3
10/4/2016	1119	7	2:26:56	2:33:17	0:06:21	0:11:00	0:18:20	24:41:45	118.37	121.04	7.34	--	0.1	2208.0	0.3
10/25/2016	1140	21	3:16:17	3:24:04	0:07:47	0:43:00	0:49:21	25:31:06	135.75	138.43	17.39	--	0.0	281.0	0.1
11/7/2016	1153	13	3:49:04	4:00:04	0:11:00	0:25:00	0:32:47	26:03:53	146.45	149.8	11.37	--	0.0	2090.0	0.1
11/22/2016	1168	15	4:29:04	4:32:44	0:03:40	0:29:00	0:40:00	26:43:53	161.84	164.5	14.7	--	0.0	3209.0	0.1
12/8/2016	1184	16	5:02:04	5:05:44	0:03:40	0:29:20	0:33:00	27:16:53	173.21	174.54	10.04	--	0.0	2052.0	0.3
12/23/2016	1199	15	5:17:44	5:33:44	0:16:00	0:12:00	0:15:40	27:32:33	179.23	185.9	11.36	--	0.2	3852.0	0.2
1/3/2017	1210	11	5:53:44	5:57:44	0:04:00	0:20:00	0:36:00	28:08:33	194.6	196.6	10.7	--	0.0	1252.0	0.0
1/16/2017	1223	13	6:21:44	6:25:44	0:04:00	0:24:00	0:28:00	28:36:33	204.63	BSG	UNK	--	0.0	1271.0	0.0
2/1/2017	1239	16	6:57:44	7:01:44	0:04:00	0:32:00	0:36:00	29:12:33	52.83	54.83	54.83	--	0.0	1659.0	0.4
2/10/2017	1248	9	7:17:44	7:21:44	0:04:00	0:16:00	0:20:00	29:32:33	61.53	62.86	8.03	--	0.1	622.0	0.2
2/28/2017	1266	18	7:57:44	8:01:44	0:04:00	0:36:00	0:40:00	30:12:33	78.91	80.25	17.39	--	0.0	915.2	0.3
3/17/2017	1283	17	8:33:44	8:41:44	0:08:00	0:32:00	0:36:00	30:48:33	89.61	93.63	13.38	--	0.2	710.2	0.3
3/29/2017	1295	12	9:05:44	9:09:44	0:04:00	0:24:00	0:32:00	31:20:33	102.03	104.325	10.695	--	0.0	910.3	0.0
4/13/2017	1310	15	9:37:44	9:41:44	0:04:00	0:28:00	0:32:00	31:52:33	115	116.36	12.035	--	0.0	1377.0	0.0
4/27/2017	1324	14	10:09:44	10:13:44	0:04:00	0:28:00	0:32:00	32:24:33	128.4	131.075	14.715	--	0.0	2000.0	0.1
5/12/2017	1339	15	10:41:44	10:45:44	0:04:00	0:28:00	0:32:00	32:56:33	141.78	143.11	12.035	--	0.0	2000.0	0.0
5/25/2017	1352	13	11:09:44	11:13:44	0:04:00	0:24:00	0:28:00	33:24:33	152.48	155.15	12.04	--	0.1	2000.0	0.0
6/6/2017	1364	12	11:21:44	11:35:05	0:13:21	0:08:00	0:12:00	33:36:33	156.5	161.8	6.65	--	0.0	2000.0	0.0
6/27/2017	1385	21	12:15:05	12:27:56	0:12:51	0:40:00	0:53:21	34:29:54	176.5	179.2	17.4	--	0.0	245.8	0.1
7/7/2017	1395	10	12:43:56	12:47:56	0:04:00	0:16:00	0:28:51	34:58:45	183.2	184.6	5.4	--	0.0	406.7	0.0
7/21/2017	1409	14	13:15:56	13:19:56	0:04:00	0:28:00	0:32:00	35:30:45	189.9	191.3	6.7	--	0.0	166.8	0.3
8/3/2017	1422	13	13:43:56	13:47:59	0:04:03	0:24:00	0:28:00	35:58:45	195.28	199.29	7.99	--	0.0	88.8	0.0
8/17/2017	1436	14	14:04:22	14:08:22	0:04:00	0:16:23	0:20:26	36:19:11	207.3	0	8.01	--	0.0	922.3	0.4
8/29/2017	1448	12	14:32:22	14:40:22	0:08:00	0:24:00	0:28:00	36:47:11	--	BSG	UNK	--	0.2	449.1	0.0
9/14/2017	1464	16	15:12:22	15:16:22	0:04:00	0:32:00	0:40:00	37:27:11	--	BSG	UNK	--	0.0	1286.0	0.0

Notes:
1. Changes to the field O&M sheets implemented in November 2015 allowed for pumping tracking both during the O&M visit and since last departure (from departure to next arrival).
2. Total since start displays time calculations to account for different pump controller values since pump controller faceplates were substituted periodically throughout system operations.
3. UNK = Unknown - Controller faceplate malfunction displayed erroneous characters and meter times. Meter readings on July 19 are inaccurate due to controller malfunction.
4. Y - F = System enabled; however, system would not pump during O&M visit due to frozen lines.
5. N - TF = System disabled due to erroneous tank full error recorded by the pump controller.
6. Drawdown calculation based on pump test conducted in well during one pump cycle. Calculation is based on measured depth to water and the volume of the well casing.
7. -- = Not Measured 8 Nitrogen tanks are 304 cubic feet, high pressure (2500 PSI) compressed gas cylinders.
8. Nitrogen tanks are 304 cubic feet, high pressure (2500 PSI) compressed gas cylinders.
9. OR = Over Range

CALENDAR			NITROGEN (PSI)			ELECTRICITY (KWH)	SYSTEM ON UPON ARRIVAL
DATE	System Operational Days	Days since previous reading	CURRENT CYLINDER READING	USED SINCE LAST	TANK REPLACED	METER READING	
9/11/13	0	0	2450	--	N		--
9/13/2013	2	2	2350	100	N		Y
9/16/2013	5	3	2300	50	N		Y
9/18/2013	7	2	2100	200	N		Y
9/25/2013	14	7	1950	150	N		Y
10/2/2013	21	7	1850	100	N		Y
10/3/2013	22	1	1800	50	N		Y
10/4/2013	23	1	1700	100	N		Y
10/9/2013	28	5	1625	75	N		Y
10/16/2013	35	7	1600	25	N		Y
10/23/2013	42	7	1525	75	N		Y
10/28/2013	47	5	1500	25	N		N - PC
10/30/2013	49	2	1450	50	N		N - PC
11/6/2013	56	7	1400	50	N		N - PC
11/12/2013	62	6	--	--	--		N - F
11/18/2013	68	6	1300	100	N		N - F
11/27/2013	77	9	1290	10	N		Y
12/4/2013	84	7	1250	40	N		N - F
12/12/2013	92	8	1250	0	N		UNK
12/18/2013	98	6	1200	50	N		N - F
12/20/2013	100	2	1200	0	N		N - F
1/6/2014	117	17	1200	0	N		N -TF
1/15/2014	126	9	1200	0	N		N -TF
1/23/2014	134	8	1200	0	N		N -TF
1/29/2014	140	6	--	--	N		N - F
2/4/2014	146	6	1200	0	N		N - F
2/12/2014	154	8	1200	0	N		Y
2/24/2014	166	12	1200	0	N		N - F
3/6/2014	176	10	1175	25	N		N - F
3/11/2014	181	5	1150	25	N		N - F
3/19/2014	189	8	1150	0	N		Y
3/27/2014	197	8	1100	50	N		Y
4/3/2014	204	7	1075	25	N		Y
4/8/2014	209	5	1050	25	N		Y
4/18/2014	219	10	1000	50	N		Y
4/23/2014	224	5	1000	0	N		Y
4/30/2014	231	7	900	100	N		Y

Table 4-1
WAC Recovery System O&M Data
Nyanza Chemical Waste Dump Superfund Site
Ashland, Massachusetts

CALENDAR			NITROGEN (PSI)			ELECTRICITY (KWH)	SYSTEM ON UPON ARRIVAL
DATE	System Operational Days	Days since previous reading	CURRENT CYLINDER READING	USED SINCE LAST	TANK REPLACED	METER READING	
5/7/2014	238	7	925	-25	N		Y
5/14/2014	245	7	--	--	N		N - FT
5/23/2014	254	9	--	--	N		N - FT
5/29/2014	260	6	900	25	Y		N - FT
6/4/2014	266	6	2550	--	N		Y
6/12/2014	274	8	2500	50	N		Y
6/18/2014	280	6	2500	0	N		N - TF
6/25/2014	287	7	2500	0	N		Y
7/2/2014	294	7	2500	0	N		Y
7/7/2014	299	5	2400	100	N		Y
7/10/2014	302	3	2400	0	N		Y
7/18/2014	310	8	2400	0	N		Y
7/23/2014	315	5	2400	0	N		Y
7/30/2014	322	7	2300	100	N		Y
8/8/2014	331	9	2300	0	N		N - TF
8/19/2014	342	11	2200	100	N		Y
8/29/2014	352	10	2200	0	N		Y
9/2/2014	356	4	2200	0	N		Y
9/9/2014	363	7	2120	80	N		Y
9/18/2014	372	9	2050	70	N		Y
9/24/2014	378	6	2050	0	N		Y
10/2/2014	386	8	2000	50	N		Y
10/8/2014	392	6	2000	0	N		Y
10/22/2014	406	14	1950	50	N		Y
11/3/2014	418	12	--	--	N		Y
11/5/2014	420	2	1900	50	N		Y
11/21/2014	436	16	1850	50	N		N - TF
12/1/2014	446	10	1825	25	N		N - TF
12/9/2014	454	8	1800	25	N		N - TF
12/16/2014	461	7	1800	0	N		Y
12/22/2014	467	6	1800	0	N		N - TF
1/6/2015	482	15	1800	0	N		N
1/23/2015	499	17	1800	0	N		N
2/3/2015	510	11	1800	0	N		N - TF
2/26/2015	533	23	--		N		N - TF
3/6/2015	541	8	1700	100	N		N - TF
3/16/2015	551	10	--		N		N - TF

CALENDAR			NITROGEN (PSI)			ELECTRICITY (KWH)	SYSTEM ON UPON ARRIVAL
DATE	System Operational Days	Days since previous reading	CURRENT CYLINDER READING	USED SINCE LAST	TANK REPLACED	METER READING	
4/2/2015	568	17	1700	0	N		N - TF
4/17/2015	583	15	1700	0	N		N - TF
4/28/2015	594	11	1700	0	N		N - TF
5/11/2015	607	13	1625	75	N		N - TF
5/21/2015	617	10	1500	125	N		N - TF
5/27/2015	623	6	1500	0	N		Y
6/12/2015	639	16	1410	90	N		Y
6/18/2015	645	6	1400	10	N		Y
7/2/2015	659	14	1400	0	N		Y
7/13/2015	670	11	1400	0	N		Y
7/29/2015	686	16	1380	20	N		Y
8/18/2015	706	20	900	480	N		Y
9/1/2015	720	14	200	700	Y		Y*
9/15/2015	734	14	2050	--	N	--	Y
10/1/2015	750	16	1900	150	N	--	Y
10/13/2015	762	12	1800	100	N	--	Y
10/29/2015	778	16	1725	75	N	--	Y
11/18/2015	798	20	1600	125	N	14221	Y
11/30/2015	810	12	1550	50	N	--	N - TF
12/11/2015	821	11	1525	25	N	--	Y
12/22/2015	832	11	1500	25	N	15155	Y
1/8/2016	849	17	1400	100	N	15859	Y
1/20/2016	861	12	1300	100	N	16359	Y - F
2/9/2016	881	20	1250	50	N	--	Y
2/17/2016	889	8	1220	30	N	17494	Y
3/1/2016	902	13	1210	10	N	18034	Y
3/23/2016	924	22	1100	110	N	18995	Y
3/30/2016	931	7	1050	50	N	19250	Y
4/14/2016	946	15	990	60	N	19924	Y
4/28/2016	960	14	890	100	N	19935	Y
5/11/2016	973	13	850	40	N	19944	Y
5/24/2016	986	13	800	50	N	19955	Y
6/7/2016	1000	14	800	0	N	19981	Y
6/21/2016	1014	14	700	100	N	20004	Y
7/8/2016	1031	17	600	100	N	20049	Y
7/19/2016	1042	11	600	0	N	20078	N

CALENDAR			NITROGEN (PSI)			ELECTRICITY (KWH)	SYSTEM ON UPON ARRIVAL
DATE	System Operational Days	Days since previous reading	CURRENT CYLINDER READING	USED SINCE LAST	TANK REPLACED	METER READING	
8/2/2016	1056	14	500	100	N	20118	N
8/17/2016	1071	15	450	50	N	20154	N
8/18/2016	1072	1	450	0	N	--	N - TF
8/31/2016	1085	13	400	50	N	20181	Y
9/7/2016	1092	7	2650	--	Y	20184	Y
9/14/2016	1099	7	2600	50	N	20191	Y
9/27/2016	1112	13	2450	150	N	20196	Y
10/4/2016	1119	7	2400	50	N	20197	Y
10/25/2016	1140	21	2250	150	N	20618	Y
11/7/2016	1153	13	2200	50	N	20630	Y
11/22/2016	1168	15	2175	25	N	20825	Y
12/8/2016	1184	16	2150	25	N	21079	Y
12/23/2016	1199	15	2100	50	N	21414	N - TF
1/3/2017	1210	11	2100	0	N	21868	Y
1/16/2017	1223	13	2020	80	N	22402	Y
2/1/2017	1239	16	1990	30	N	23063	Y
2/10/2017	1248	9	1900	90	N	23433	Y
2/28/2017	1266	18	1890	10	N	24176	Y
3/17/2017	1283	17	1750	140	N	24870	Y
3/29/2017	1295	12	1700	50	N	25365	Y
4/13/2017	1310	15	1610	90	N	25980	Y
4/27/2017	1324	14	1500	110	N	25995	Y
5/12/2017	1339	15	1400	100	N	26009	Y
5/25/2017	1352	13	1400	0	N	26033	Y
6/6/2017	1364	12	1350	50	N	26044	N
6/27/2017	1385	21	1300	50	N	26115	Y
7/7/2017	1395	10	1300	0	N	26147	Y
7/21/2017	1409	14	1250	50	N	26202	Y
8/3/2017	1422	13	1200	50	N	26243	Y
8/17/2017	1436	14	1100	100	N	26290	N
8/29/2017	1448	12	1000	100	N	26325	Y
9/14/2017	1464	16	1000	0	N	26347	Y

Notes:
1. Changes to the field O&M sheets implemented in November 2015 allowed for pumping tracking both during the O&M visit and since last departure (from departure to next arrival).
2. Total since start displays time calculations to account for different pump controller values since pump controller faceplates were substituted periodically throughout system operations.
3. UNK = Unknown - Controller faceplate malfunction displayed erroneous characters and meter times. Meter readings on July 19 are inaccurate due to controller malfunction.
4. Y - F = System enabled; however, system would not pump during O&M visit due to frozen lines.
5. N - TF = System disabled due to erroneous tank full error recorded by the pump controller.
6. Drawdown calculation based on pump test conducted in well during one pump cycle. Calculation is based on measured depth to water and the volume of the well casing.
7. -- = Not Measured 8 Nitrogen tanks are 304 cubic feet, high pressure (2500 PSI) compressed gas cylinders.
8. Nitrogen tanks are 304 cubic feet, high pressure (2500 PSI) compressed gas cylinders.
9. OR = Over Range

Table 4-2
Nyacol Recovery System O&M Data
Nyanza Chemical Waste Dump Superfund Site
Ashland, Massachusetts

CALENDAR			DISCHARGE (PUMPING) TIME (hr:min:sec)						LIQUID (Gallons)			
DATE	System Operational Days	Days since previous reading	ARRIVAL METER READING	DEPARTURE METER READING	TOTAL DURING O&M VISIT	TOTAL SINCE LAST DEPARTURE (automated pumping)	TOTAL SINCE LAST O&M VISIT (arrival to arrival)	TOTAL SINCE START	CALCULATED VOLUME ON ARRIVAL	CALCULATED VOLUME ON DEPARTURE	TOTAL GALLONS PUMPED SINCE LAST O&M VISIT	DRAWDOWN CALCULATION (ft)
9/13/2013	0	0	0:07:04				0:00:00	0:07:04		BSG	UNK	--
9/18/2013	5	5	0:08:04				0:01:00	0:08:04		BSG	UNK	--
9/25/2013	12	7	0:09:04				0:01:00	0:09:04		BSG	UNK	--
10/2/2013	19	7	0:09:19				0:00:15	0:09:19		BSG	UNK	--
10/4/2013	21	2	0:12:34				0:03:15	0:12:34		BSG	UNK	--
10/9/2013	26	5	0:16:19				0:03:45	0:16:19		BSG	UNK	--
10/16/2013	33	7	0:19:19				0:03:00	0:19:19		BSG	UNK	--
10/23/2013	40	7	0:19:38				0:00:19	0:19:38		BSG	UNK	--
10/28/2013	45	5	0:20:00				0:00:22	0:20:00		BSG	UNK	--
10/30/2013	47	2	0:20:00				0:00:00	0:20:00		BSG	UNK	--
11/6/2013	54	7	0:21:16				0:01:16	0:21:16		BSG	UNK	0.27
11/12/2013	60	6	0:36:30				0:15:14	0:36:30		BSG	UNK	--
11/18/2013	66	6	0:47:32				0:11:02	0:47:32		BSG	UNK	--
11/27/2013	75	9	0:50:32				0:03:00	0:50:32		BSG	UNK	--
12/4/2013	82	7	0:52:32				0:02:00	0:52:32		42.1	42.1	--
12/12/2013	90	8	0:53:58				0:01:26	0:53:58		42.1	0.0	--
12/18/2013	96	6	0:59:21				0:05:23	0:59:21		42.8	0.7	--
12/20/2013	98	2	--				--	--		--	--	--
1/6/2014	115	17	0:59:21				0:00:00	0:59:21		42.8	0.0	--
1/15/2014	124	9	1:02:44				0:03:23	1:02:44		45.5	2.7	--
1/23/2014	132	8	1:04:04				0:01:20	1:04:04		48.2	2.7	--
1/29/2014	138	6	1:05:49				0:01:45	1:05:49		48.8	0.7	--
2/4/2014	144	6	1:06:54				0:01:05	1:06:54		50.5	1.7	--
2/12/2014	152	8	1:07:54				0:01:00	1:07:54		50.5	0.0	--
2/24/2014	164	12	1:08:54				0:01:00	1:08:54		52.8	2.3	--

CALENDAR			DISCHARGE (PUMPING) TIME (hr:min:sec)						LIQUID (Gallons)			
DATE	System Operational Days	Days since previous reading	ARRIVAL METER READING	DEPARTURE METER READING	TOTAL DURING O&M VISIT	TOTAL SINCE LAST DEPARTURE (automated pumping)	TOTAL SINCE LAST O&M VISIT (arrival to arrival)	TOTAL SINCE START	CALCULATED VOLUME ON ARRIVAL	CALCULATED VOLUME ON DEPARTURE	TOTAL GALLONS PUMPED SINCE LAST O&M VISIT	DRAWDOWN CALCULATION (ft)
3/6/2014	174	10	1:10:54				0:02:00	1:10:54		54.8	2.0	--
3/11/2014	179	5	1:12:54				0:02:00	1:12:54		55.5	0.7	--
3/19/2014	187	8	1:13:54				0:01:00	1:13:54		56.2	0.7	--
3/27/2014	195	8	1:18:55				0:05:01	1:18:55		60.9	4.7	--
4/3/2014	202	7	1:22:40				0:03:45	1:22:40		62.2	1.3	--
4/8/2014	207	5	1:23:30				0:00:50	1:23:30		64.2	2.0	--
4/18/2014	217	10	1:25:35				0:02:05	1:25:35		66.2	2.0	--
4/23/2014	222	5	1:26:50				0:01:15	1:26:50		66.9	0.7	--
4/30/2014	229	7	1:27:40				0:00:50	1:27:40		68.9	2.0	--
5/7/2014	236	7	1:28:55				0:01:15	1:28:55		70.9	2.0	--
5/14/2014	243	7	1:31:15				0:02:20	1:31:15		71.6	0.7	--
5/23/2014	252	9	1:32:55				0:01:40	1:32:55		73.6	2.0	--
5/29/2014	258	6	1:34:30				0:01:35	1:34:30		BSG	UNK	--
6/4/2014	264	6	1:35:20				0:00:50	1:35:20		BSG	UNK	--
6/12/2014	272	8	1:36:10				0:00:50	1:36:10		BSG	UNK	--
6/18/2014	278	6	1:37:00				0:00:50	1:37:00		BSG	UNK	--
6/25/2014	285	7	1:37:50				0:00:50	1:37:50		BSG	UNK	--
7/2/2014	292	7	1:38:40				0:00:50	1:38:40		BSG	UNK	--
7/7/2014	297	5	1:39:30				0:00:50	1:39:30		BSG	UNK	--
7/10/2014	300	3	1:40:20				0:00:50	1:40:20		BSG	UNK	--
7/18/2014	308	8	1:41:10				0:00:50	1:41:10		BSG	UNK	--
7/23/2014	313	5	1:42:00				0:00:50	1:42:00		BSG	UNK	--
7/30/2014	320	7	1:42:50				0:00:50	1:42:50		BSG	UNK	--

Table 4-2
Nyacol Recovery System O&M Data
Nyanza Chemical Waste Dump Superfund Site
Ashland, Massachusetts

CALENDAR			DISCHARGE (PUMPING) TIME (hr:min:sec)						LIQUID (Gallons)			
DATE	System Operational Days	Days since previous reading	ARRIVAL METER READING	DEPARTURE METER READING	TOTAL DURING O&M VISIT	TOTAL SINCE LAST DEPARTURE (automated pumping)	TOTAL SINCE LAST O&M VISIT (arrival to arrival)	TOTAL SINCE START	CALCULATED VOLUME ON ARRIVAL	CALCULATED VOLUME ON DEPARTURE	TOTAL GALLONS PUMPED SINCE LAST O&M VISIT	DRAWDOWN CALCULATION (ft)
8/8/2014	329	9	1:44:20				0:01:30	1:44:20		BSG	UNK	--
8/19/2014	340	11	1:46:00				0:01:40	1:46:00		BSG	UNK	--
8/29/2014	350	10	1:47:40				0:01:40	1:47:40		BSG	UNK	--
9/2/2014	354	4	1:48:05				0:00:25	1:48:05		BSG	UNK	--
9/9/2014	361	7	1:49:20				0:01:15	1:49:20		BSG	UNK	--
9/18/2014	370	9	1:50:35				0:01:15	1:50:35		BSG	UNK	--
9/24/2014	376	6	1:51:25				0:00:50	1:51:25		BSG	UNK	0.24
10/2/2014	384	8	1:52:15				0:00:50	1:52:15		BSG	UNK	--
10/8/2014	390	6	1:53:31				0:01:16	1:53:31		BSG	UNK	--
10/22/2014	404	14	1:55:22				0:01:51	1:55:22		BSG	UNK	0.18
11/3/2014	416	12	1:56:38				0:01:16	1:56:38		BSG	UNK	--
11/6/2014	419	3	1:57:03				0:00:25	1:57:03		BSG	UNK	--
11/21/2014	434	15	2:06:08				0:09:05	2:06:08		BSG	UNK	0.20
12/1/2014	444	10	2:09:46				0:03:38	2:09:46		BSG	UNK	--
12/9/2014	452	8	2:11:06				0:01:20	2:11:06		BSG	UNK	--
12/16/2014	459	7	2:12:26				0:01:20	2:12:26		42.8	42.8	0.37
12/22/2014	465	6	2:13:46				0:01:20	2:13:46		45.5	2.7	--
1/6/2015	480	15	2:16:26				0:02:40	2:16:26		48.2	2.7	--
1/23/2015	497	17	5:15:58				0:08:22	2:24:48		50.8	2.7	--
2/3/2015	508	11	5:18:38				0:02:40	2:27:28		53.5	2.7	--
2/26/2015	531	23	5:23:18				0:04:40	2:32:08		55.2	1.7	--
3/6/2015	539	8	5:46:54				0:23:36	2:55:44		61.5	6.4	--
3/16/2015	549	10	5:48:54				0:02:00	2:57:44		64.2	2.7	--

CALENDAR			DISCHARGE (PUMPING) TIME (hr:min:sec)						LIQUID (Gallons)			
DATE	System Operational Days	Days since previous reading	ARRIVAL METER READING	DEPARTURE METER READING	TOTAL DURING O&M VISIT	TOTAL SINCE LAST DEPARTURE (automated pumping)	TOTAL SINCE LAST O&M VISIT (arrival to arrival)	TOTAL SINCE START	CALCULATED VOLUME ON ARRIVAL	CALCULATED VOLUME ON DEPARTURE	TOTAL GALLONS PUMPED SINCE LAST O&M VISIT	DRAWDOWN CALCULATION (ft)
4/2/2015	566	17	5:51:34				0:02:40	3:00:24		69.6	5.3	--
4/17/2015	581	15	5:54:54				0:03:20	3:03:44		73.6	4.0	--
4/28/2015	592	11	5:56:54				0:02:00	3:05:44		76.2	2.7	--
5/11/2015	605	13	5:59:34				0:02:40	3:08:24		--	--	0.49
5/21/2015	615	10	6:02:56				0:03:22	3:11:46		83.0	6.8	--
5/27/2015	621	6	6:04:17				0:01:21	3:13:07		BSG	UNK	--
6/12/2015	637	16	6:06:57				0:02:40	3:15:47		BSG	UNK	--
6/18/2015	643	6	6:08:17				0:01:20	3:17:07		BSG	UNK	--
7/2/2015	657	14	6:10:58				0:02:41	3:19:48		BSG	UNK	--
7/13/2015	668	11	6:14:18				0:03:20	3:23:08		BSG	UNK	--
7/29/2015	684	16	6:16:58				0:02:40	3:25:48		BSG	UNK	0.46
8/18/2015	704	20	6:20:18				0:03:20	3:29:08		BSG	UNK	--
9/1/2015	718	14	6:22:58				0:02:40	3:31:48		BSG	UNK	--
9/15/2015	732	14	6:25:38	--	--	--	0:02:40	3:34:28		BSG	UNK	--
10/1/2015	748	16	6:28:15	--	--	--	0:02:37	3:37:05	--	BSG	UNK	--
10/13/2015	760	12	6:30:43	--	--	--	0:02:28	3:39:33	--	BSG	UNK	--
10/29/2015	776	16	6:33:34	--	--	--	0:02:51	3:42:24	--	BSG	UNK	0.35
11/18/2015	796	20	6:36:34	6:39:57	0:03:23	--	0:03:00	3:45:24	BSG	BSG	UNK	--
12/1/2015	809	13	6:43:11	--	--	--	0:06:37	3:52:01	--	40.8	40.8	--
12/2/2015	810	1	6:50:12	6:51:07	0:00:55	--	0:07:01	3:59:02	--	40.8	0.0	--
12/11/2015	819	9	6:51:07	6:51:07	0:00:00	0:00:00	0:00:55	3:59:57	44.8	44.8	4.0	--
12/22/2015	830	11	6:51:07	6:51:07	0:00:00	0:00:00	0:00:00	3:59:57	44.8	44.8	0.0	--
1/8/2016	847	17	6:51:07	6:51:07	0:00:00	0:00:00	0:00:00	3:59:57	44.8	44.8	0.0	--
1/20/2016	859	12	6:51:07	6:55:08	0:04:01	0:00:00	0:00:00	3:59:57	44.8	45.5	0.7	--
2/9/2016	879	20	6:55:08	6:55:08	0:00:00	0:00:00	0:04:01	4:03:58	45.5	45.5	0.0	--
2/17/2016	887	8	6:55:08	6:55:48	0:00:40	0:00:00	0:00:00	4:03:58	45.5	46.1	0.6	--

Table 4-2
Nyacol Recovery System O&M Data
Nyanza Chemical Waste Dump Superfund Site
Ashland, Massachusetts

CALENDAR			DISCHARGE (PUMPING) TIME (hr:min:sec)						LIQUID (Gallons)			
DATE	System Operational Days	Days since previous reading	ARRIVAL METER READING	DEPARTURE METER READING	TOTAL DURING O&M VISIT	TOTAL SINCE LAST DEPARTURE (automated pumping)	TOTAL SINCE LAST O&M VISIT (arrival to arrival)	TOTAL SINCE START	CALCULATED VOLUME ON ARRIVAL	CALCULATED VOLUME ON DEPARTURE	TOTAL GALLONS PUMPED SINCE LAST O&M VISIT	DRAWDOWN CALCULATION (ft)
3/1/2016	900	13	6:55:48	6:55:48	0:00:00	0:00:00	0:00:40	4:04:38	46.1	46.1	0.0	--
3/23/2016	922	22	6:55:48	6:55:48	0:00:00	0:00:00	0:00:00	4:04:38	46.1	46.1	0.0	--
3/30/2016	929	7	6:55:48	6:55:48	0:00:00	0:00:00	0:00:00	4:04:38	46.1	46.1	0.0	--
4/14/2016	944	15	6:55:48	6:55:48	0:00:00	0:00:00	0:00:00	4:04:38	46.1	46.1	0.0	--
4/28/2016	958	14	6:55:48	6:55:48	0:00:00	0:00:00	0:00:00	4:04:38	46.1	46.1	0.0	--
5/11/2016	971	13	6:55:48	6:55:48	0:00:00	0:00:00	0:00:00	4:04:38	46.1	BSG	UNK	--
5/24/2016	984	13	6:55:48	6:55:48	0:00:00	0:00:00	0:00:00	4:04:38	0	0.0	0.0	--
6/7/2016	998	14	6:55:48	6:55:48	0:00:00	0:00:00	0:00:00	4:04:38	0	0.0	0.0	--
6/21/2016	1012	14	6:55:48	6:55:48	0:00:00	0:00:00	0:00:00	4:04:38	0	0.0	0.0	--
7/8/2016	1029	17	6:55:48	6:55:48	0:00:00	0:00:00	0:00:00	4:04:38	0	0.0	0.0	--
7/19/2016	1040	11	6:55:48	6:56:28	0:00:40	0:00:00	0:00:00	4:04:38	0	0.0	0.0	--
8/2/2016	1054	14	6:56:28	6:56:28	0:00:00	0:00:00	0:00:40	4:05:18	0	0.0	0.0	--
8/17/2016	1069	15	No Controller Installed						0	0.0	0.0	--
9/7/2016	1090	21	--	--		--	--	--	0	0.0	0.0	--
9/14/2016	1097	7	0:00:00	0:09:36		--	--	--	0	0.0	0.0	--
9/27/2016	1110	13	0:15:12	0:17:04		0:07:28	0:15:12	4:20:30	UNK	UNK	UNK	--
10/4/2016	1117	7	0:19:52	0:21:28	0:01:36	0:04:24	0:04:40	4:25:10	13.37	UNK	UNK	--
10/25/2016	1138	21	0:28:08	0:28:48	0:00:40	0:07:20	0:08:16	4:33:26	UNK	UNK	UNK	--
11/7/2016	1151	13	0:32:48	0:33:28	0:00:40	0:04:40	0:04:40	4:38:06	32.1	UNK	UNK	--
11/22/2016	1166	15	0:38:08	0:39:27	0:01:19	0:05:59	0:05:20	4:43:26	UNK	UNK	UNK	--

Table 4-2
Nyacol Recovery System O&M Data
Nyanza Chemical Waste Dump Superfund Site
Ashland, Massachusetts

CALENDAR			DISCHARGE (PUMPING) TIME (hr:min:sec)						LIQUID (Gallons)			
DATE	System Operational Days	Days since previous reading	ARRIVAL METER READING	DEPARTURE METER READING	TOTAL DURING O&M VISIT	TOTAL SINCE LAST DEPARTURE (automated pumping)	TOTAL SINCE LAST O&M VISIT (arrival to arrival)	TOTAL SINCE START	CALCULATED VOLUME ON ARRIVAL	CALCULATED VOLUME ON DEPARTURE	TOTAL GALLONS PUMPED SINCE LAST O&M VISIT	DRAWDOWN CALCULATION (ft)
12/8/2016	1182	16	0:45:59	0:46:48	0:00:49	0:07:21	0:07:51	4:51:17	52.83	54.8	UNK	--
12/23/2016	1197	15	0:52:31	0:53:20	0:00:49	0:06:32	0:06:32	4:57:49	60.85	61.5	6.7	--
1/3/2017	1208	11	0:57:25	0:58:14	0:00:49	0:04:54	0:04:54	5:02:43	66.87	68.2	6.7	--
1/16/2017	1221	13	1:03:08	1:03:57	0:00:49	0:05:43	0:05:43	5:08:26	72.22	BSG	5.4	--
2/1/2017	1237	16	1:10:29	1:11:28	0:00:59	0:07:31	0:07:21	5:15:47	BSG	BSG	UNK	--
2/10/2017	1246	9	1:14:34	1:19:19	0:04:45	0:07:51	0:04:05	5:19:52	BSG	BSG	UNK	--
2/28/2017	1264	18	1:26:40	1:27:29	0:00:49	0:08:10	0:12:06	5:31:58	46.81	48.2	UNK	--
3/17/2017	1281	17	1:34:01	1:34:50	0:00:49	0:07:21	0:07:21	5:39:19	54.83	55.5	7.4	--
3/29/2017	1293	12	1:39:44	1:41:22	0:01:38	0:06:32	0:05:43	5:45:02	61.53	64.2	8.7	--
4/13/2017	1308	15	1:47:05	1:47:54	0:00:49	0:06:32	0:07:21	5:52:23	73.83	74.9	10.7	--
4/27/2017	1322	14	1:53:37	1:54:31	0:00:54	0:06:37	0:06:32	5:58:55	83.46	85.1	10.2	--
5/12/2017	1337	15	2:00:14	2:01:03	0:00:49	0:06:32	0:06:37	6:05:32	93.63	95.0	9.9	--
5/25/2017	1350	13	2:05:57	2:06:46	0:00:49	0:05:43	0:05:43	6:11:15	102.99	105.7	10.7	--
6/6/2017	1362	12	2:08:24	2:10:02	0:01:38	0:03:16	0:02:27	6:13:42	107	109.7	4.0	--
6/27/2017	1383	21	2:19:01	2:20:25	0:01:24	0:10:23	0:10:37	6:24:19	123	124.3	14.6	--
7/7/2017	1393	10	2:23:41	2:25:05	0:01:24	0:04:40	0:04:40	6:28:59	129.7	131.0	6.7	--
7/21/2017	1407	14	2:30:48	2:31:37	0:00:49	0:06:32	0:07:07	6:36:06	139.1	140.4	9.4	--
8/3/2017	1420	13	2:36:31	2:37:20	0:00:49	0:05:43	0:05:43	6:41:49	147.1	147.1	6.7	--
8/17/2017	1434	14	2:43:03	--	--	--	0:06:32	6:48:21	147.1	0.0	0.0	--
8/29/2017	1446	12	2:43:03	--	--	--	0:00:00	6:48:21	0	0.0	0.0	--
9/14/2017	1462	16	2:43:03	--	--	--	0:00:00	6:48:21	0	0.0	0.0	--

Notes:

1. Changes to the field O&M sheets implemented in November 2015 allowed for pumping tracking both during the O&M visit and since last departure (from departure to next arrival).
2. Total since start displays time calculations to account for different pump controller values since pump controller faceplates were substituted periodically throughout system operations.
3. BSG = Below Sight Glass (No liquid visible on the sight glass to make a measurement).
4. Drawdown calculation based on pump test conducted in well during one pump cycle. Calculation is based on measured depth to water and the volume of the well casing.
5. UNK = Unknown
6. Nitrogen tanks are 304 cubic feet, high pressure (2500 PSI) compressed gas cylinders.
7. '-- = Not Measured
8. System intentionally disabled on December 2 to allow DNAPL to pool in the well.

CALENDAR			PID SCREENING (PPM)			NITROGEN (PSI)	
DATE	System Operational Days	Days since previous reading	ROOM	CARBON DRUM INLET	CARBON DRUM OUTLET	PSI	USED SINCE LAST
9/13/2013	0	0	0.0	89.0	2.8	2280	--
9/18/2013	5	5	--	1320.0	0.0	1950	330
9/25/2013	12	7	0.0	930.0	0.0	1750	200
10/2/2013	19	7	0.2	OVER 3700	1.1	1575	175
10/4/2013	21	2	0.1	--	3.7	1500	75
10/9/2013	26	5	0.2	160.0	1.8	1400	100
10/16/2013	33	7	0.1	570.0	2.7	1200	200
10/23/2013	40	7	0.1	650.0	1.8	1050	150
10/28/2013	45	5	0.2	473.0	0.8	1000	50
10/30/2013	47	2	0.5	200.0	0.9	975	25
11/6/2013	54	7	0.0	863.0	0.0	825	150
11/12/2013	60	6	0.0	--	--	700	125
11/18/2013	66	6	0.3	--	0.8	675	25
11/27/2013	75	9	--	--	--	550	125
12/4/2013	82	7	0.0	--	0.6	400	150
12/12/2013	90	8	0.0	--	--	300	100
12/18/2013	96	6	--	--	0.0	2300	UNK
12/20/2013	98	2		--	--	--	--
1/6/2014	115	17	0.0	--	0.0	1300	1000
1/15/2014	124	9	0.0	--	1.0	910	1250
1/23/2014	132	8	0.1	--	1.4	600	310
1/29/2014	138	6	0.2	--	0.7	200/2250	400
2/4/2014	144	6	0.0	200.0	0.7	1900	350
2/12/2014	152	8	0.0	--	0.1	1350	550
2/24/2014	164	12	0.3	--	0.7	1400	-50

Table 4-2
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CALENDAR			PID SCREENING (PPM)			NITROGEN (PSI)	
DATE	System Operational Days	Days since previous reading	ROOM	CARBON DRUM INLET	CARBON DRUM OUTLET	PSI	USED SINCE LAST
3/6/2014	174	10	0.0	--	0.3	800	600
3/11/2014	179	5	0.1	OVER 500	0.9	500	300
3/19/2014	187	8	0.0	42.1	0.5	0/2250	500
3/27/2014	195	8	0.0	--	0.7	2050	200
4/3/2014	202	7	0.0	--	0.1	1750	300
4/8/2014	207	5	1.0	--	0.0	1500	250
4/18/2014	217	10	0.0	--	0.0	1120	380
4/23/2014	222	5	0.0	--	0.1	975	145
4/30/2014	229	7	0.1	--	0.1	700	275
5/7/2014	236	7	0.0	--	0.1	400	300
5/14/2014	243	7	0.0	--	0.1	0	400
5/23/2014	252	9	0.0	--	0.6	2200	UNK
5/29/2014	258	6	0.0	--	0.3	2075	125
6/4/2014	264	6	0.0	--	0.0	1900	175
6/12/2014	272	8	0.0	--	0.0	1700	200
6/18/2014	278	6	0.0	--	0.0	1600	100
6/25/2014	285	7	0.0	--	0.0	1400	200
7/2/2014	292	7	0.0	--	0.0	1200	200
7/7/2014	297	5	--	--	--	1100	100
7/10/2014	300	3	0.0	--	0.6	1000	100
7/18/2014	308	8	0.1	--	0.4	850	150
7/23/2014	313	5	0.0	--	0.0	850	0
7/30/2014	320	7	0.0	1652.0	0.0	800	50

CALENDAR			PID SCREENING (PPM)			NITROGEN (PSI)	
DATE	System Operational Days	Days since previous reading	ROOM	CARBON DRUM INLET	CARBON DRUM OUTLET	PSI	USED SINCE LAST
8/8/2014	329	9	--	--	--	800	0
8/19/2014	340	11	0.1	87.5	0.7	750	50
8/29/2014	350	10	0.0	693.0	0.0	750	0
9/2/2014	354	4	0.0	271.0	0.0	750	0
9/9/2014	361	7	0.2	3927.0	0.0	720	30
9/18/2014	370	9	0.1	1422.0	0.0	700	20
9/24/2014	376	6	0.2	600.0	0.0	700	0
10/2/2014	384	8	0.0	247.0	0.0	700	0
10/8/2014	390	6	0.3	652.0	0.0	700	0
10/22/2014	404	14	0.2	204.0	0.2	690	10
11/3/2014	416	12	--	--	--	--	--
11/6/2014	419	3	0.0	264.0	0.0	650	40
11/21/2014	434	15	0.3	501.0	0.6	600	50
12/1/2014	444	10	0.0	411.0	2.1	600	0
12/9/2014	452	8	0.3	--	--	550	50
12/16/2014	459	7	--	--	--	550	0
12/22/2014	465	6	0.0	338.0	0.9	525	25
1/6/2015	480	15	0.0	5.0	0.8	450	75
1/23/2015	497	17	0.0	410.0	0.1	2200	0
2/3/2015	508	11	0.0	588.0	0.6	1950	250
2/26/2015	531	23	0.0	190.0	0.0	1200	750
3/6/2015	539	8	0.0	240.0	0.1	950	250
3/16/2015	549	10	0.0	84.7	0.3	690	260

CALENDAR			PID SCREENING (PPM)			NITROGEN (PSI)	
DATE	System Operational Days	Days since previous reading	ROOM	CARBON DRUM INLET	CARBON DRUM OUTLET	PSI	USED SINCE LAST
4/2/2015	566	17	0.0	253.0	0.0	0/450	690
4/17/2015	581	15	0.1	59.1	1.9	2475	450
4/28/2015	592	11	0.0	OR (>9999)	0.0	1820	655
5/11/2015	605	13	0.0	295.0	1.1	1390	430
5/21/2015	615	10	0.1	150.0	0.0	1000	390
5/27/2015	621	6	--	--	--	950	50
6/12/2015	637	16	0.0	420.0	2.1	650	300
6/18/2015	643	6	0.0	678.0	0.0	550	100
7/2/2015	657	14	0.0	700.0	0.0	250/2550	300
7/13/2015	668	11	0.0	1276.0	0.0	2350	200
7/29/2015	684	16	0.0	500.0	0.4	1920	430
8/18/2015	704	20	0.2	430.0	0.3	1420	500
9/1/2015	718	14	0.0	500.0	0.0	1100	320
9/15/2015	732	14	0.0	--	0.0	690	410
10/1/2015	748	16	0.0	415.5	0.5	490	200
10/13/2015	760	12	0.0	244.0	0.0	0/2500	490
10/29/2015	776	16	0.0	350.0	0.1	1050	1450
11/18/2015	796	20	0.0	325.0	0.3	400	1050
12/1/2015	809	13	0.1	--	--	2000	500
12/2/2015	810	1	0.2	582.2	0.2	2000	0
12/11/2015	819	9	--	--	--	2100	-100
12/22/2015	830	11	0.2	15.7	0.2	2100	0
1/8/2016	847	17	0.0	9.5	0.2	2100	0
1/20/2016	859	12	0.0	155.0	0.0	2020	80
2/9/2016	879	20	0.0	15.3	0.1	--	--
2/17/2016	887	8	0.0	88.8	0.0	2020	0

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CALENDAR			PID SCREENING (PPM)			NITROGEN (PSI)	
DATE	System Operational Days	Days since previous reading	ROOM	CARBON DRUM INLET	CARBON DRUM OUTLET	PSI	USED SINCE LAST
3/1/2016	900	13	0.0	16.8	0.3	--	--
3/23/2016	922	22	0.1	11.8	0.3	--	--
3/30/2016	929	7	0.0	15.1	0.2	--	--
4/14/2016	944	15	1.2	27.4	1.2	--	--
4/28/2016	958	14	0.0	26.5	0.0	--	--
5/11/2016	971	13	0.0	81.7	0.3	--	--
5/24/2016	984	13	0.0	9.0	0.0	--	--
6/7/2016	998	14	0.0	56.4	0.4	--	--
6/21/2016	1012	14	0.0	101.0	0.0	--	--
7/8/2016	1029	17	0.0	11.4	0.0	--	--
7/19/2016	1040	11	0.1	--	--	--	--
8/2/2016	1054	14	0.0	1.9	0.0	--	--
8/17/2016	1069	15	0.0	31.7	0.0	--	--
9/7/2016	1090	21	--	--	--	--	--
9/14/2016	1097	7	0.0	0.4	--	2050	--
9/27/2016	1110	13	0.0	218.0	0.0	1825	225
10/4/2016	1117	7	0.0	200.0	0.0	1800	25
10/25/2016	1138	21	0.0	179.8	0.0	1690	110
11/7/2016	1151	13	0.0	80.0	0.0	1600	90
11/22/2016	1166	15	0.0	23.2	0.0	1500	100

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Nyacol Recovery System O&M Data
Nyanza Chemical Waste Dump Superfund Site
Ashland, Massachusetts

CALENDAR			PID SCREENING (PPM)			NITROGEN (PSI)	
DATE	System Operational Days	Days since previous reading	ROOM	CARBON DRUM INLET	CARBON DRUM OUTLET	PSI	USED SINCE LAST
12/8/2016	1182	16	0.0	80.6	0.3	1450	50
12/23/2016	1197	15	0.0	50.4	0.2	1510	
1/3/2017	1208	11	0.0	45.0	0.2	1500	10
1/16/2017	1221	13	0.0	58.7	0.0	1400	100
2/1/2017	1237	16	0.0	45.0	0.1	1390	10
2/10/2017	1246	9	0.1	74.1	0.3	1320	70
2/28/2017	1264	18	0.0	42.3	0.1	1300	20
3/17/2017	1281	17	0.0	9.5	0.2	1200	100
3/29/2017	1293	12	0.2	20.1	0.0	1190	10
4/13/2017	1308	15	0.0	30.1	0.0	1110	80
4/27/2017	1322	14	0.0	56.9	0.0	1050	60
5/12/2017	1337	15	0.0	43.1	0.0	1000	50
5/25/2017	1350	13	0.0	29.4	0.0	1000	0
6/6/2017	1362	12	0.0	85.6	0.0	1000	0
6/27/2017	1383	21	0.0	245.8	0.1	900	100
7/7/2017	1393	10	0.0	20.4	0.0	900	0
7/21/2017	1407	14	0.1	25.6	0.4	800	100
8/3/2017	1420	13	0.0	18.8	0.0	750	50
8/17/2017	1434	14	0.0	--	--	--	--
8/29/2017	1446	12	0.1	--	--	--	--
9/14/2017	1462	16	0.0	--	--	--	--

Notes:

1. Changes to the field O&M sheets implemented in November 2015 allowed for pumping tracking both during the O&M visit and since last departure (from departure to next arrival).
2. Total since start displays time calculations to account for different pump controller values since pump controller faceplates were substituted periodically throughout system operations.
3. BSG = Below Sight Glass (No liquid visible on the sight glass to make a measurement).
4. Drawdown calculation based on pump test conducted in well during one pump cycle. Calculation is based on measured depth to water and the volume of the well casing.
5. UNK = Unknown
6. Nitrogen tanks are 304 cubic feet, high pressure (2500 PSI) compressed gas cylinders.
7. '-- = Not Measured
8. System intentionally disabled on December 2 to allow DNAPL to pool in the well.

Table 4-3
WAC O&M Data Summary
Nyanza Chemical Waste Dump Superfund Site
Ashland, Massachusetts
Page 1 of 2

DATE		Liquid Recovered (Gallons)		Nitrogen Consumed (PSI)		Electricity Consumed (KWH)	Calendar				
		Monthly	Operational Year	Monthly	Operational Year	Operational Year	Days (Month)	Days (Operational Year)	Down Days (Per Month)	Down days (Per Operational Year)	% System Off-Line (Operational Year)
2013	September	47.5 (est)	48	500	500	--	20	20	0	0	0%
	October	37.2	247	500	1550	--	31	365	8	120	33%
	November	23.6		160			30		18		
	December	6.7		90			31		13		
2014	January	6.0		0			31		23		
	February	5.3		0			28		17		
	March	6.0		100			31		11		
	April	63.5		200			30		0		
	May	8.7		0			31		23		
	June	UNK - BSG		50			30		3		
	July*	61.5		200			31		0		
	August	14.7		100			31		4		
	September	13.7		150			30		0		
	October	9.1	140	100	1850	--	31	365	0	159	--
	November	16.1		100			30		8		
	December	29.4		50			31		17		
2015	January	1.3		0			31		23		
	February	6.7		0			28		28		
	March	**ER**		100			31		31		
	April	14.7		0			30		31		
	May	14.7		200			31		21		
	June	UNK - BSG		100			30		0		
	July	UNK - BSG		20			31		0		
	August	UNK - BSG		480			31		0		
	September*	48.2		700			30		0		
	October	16.1	241	325	1650	--	31	336	0	24	7%
	November	12.7		175		5960	30		6		
	December	28.8		50			31		0		

Table 4-3
WAC O&M Data Summary
Nyanza Chemical Waste Dump Superfund Site
Ashland, Massachusetts

DATE		Liquid Recovered (Gallons)		Nitrogen Consumed (PSI)		Electricity Consumed (KWH)	Calendar				
		Monthly	Operational Year	Monthly	Operational Year	Operational Year	Days (Month)	Days (Operational Year)	Down Days (Per Month)	Down days (Per Operational Year)	% System Off-Line (Operational Year)
2016	January	12.4	241	200	1650	5960	31	336	0	24	7%
	February	17.4		80			29		0		
	March	43.5		170			31		0		
	April	24.1		160			30		0		
	May	UNK - BSG		90			31		0		
	June	UNK - BSG		100			30		0		
	July*	60.2		100			31		12		
	August	26.1		200			31		6		
	September	33.4	324	200	1650	6144	30	365	0	20	5%
	October	24.7		200			31		0		
	November	26.1		75			30		0		
	December	21.4		75			31		7		
2017	January	10.7		80			31		0		
	February*	80.3		130			28		0		
	March	24.1		190			31		0		
	April	26.8		200			30		0		
	May	24.1		100			31		0		
	June	24.1		100			30		0		
	July	12.1		50			31		0		
	August	16.0		250			31		13		
Totals	Total DNAPL Recovered		65	Total N Tanks Used	1		Total days since system start	1451	Total days system down since start	323	22%

Notes:

1. Monthly totals are estimated values and include volumes when the readings were taken, not when actual pumping/usage occurred. (i.e. - Pumping periods that extend across month end are included in the subsequent month).

2. * Nobis makes no volume calculations when the tank volume is below the limit of the sight glass (i.e. for several O&M visits after liquid is removed from the holding tank). Tank volume is captured once liquid is visible in the sight glass - tank volume is recorded during the period that liquid becomes visible.

3. System components report system shut down due to conditions such as low battery, no power, and actual tank full conditions; however, system components are unable to report when a system goes off-line due to conditions such as freezing or erroneous tank full alarms. Nobis used half of the duration between site visits to estimate system down time when a previously enabled system was found to be off-line upon return.

4. Operational Year = Period Of Performance (September 1, 2016 through August 31, 2017).

5. Observations, tank gauging, and jar testing has determined that approximately 20% of recovered liquid is free-phase DNAPL.

Table 4-4
Nyacol O&M Data Summary
Nyanza Chemical Waste Dump Superfund Site
Ashland, Massachusetts
Page 1 of 2

DATE		Liquid Recovered (Gallons)		Nitrogen Consumed (PSI)		Calendar				
		Monthly	Operational Year	Monthly	Operational Year	Days (Month)	Days (Operational Year)	Down Days (Per Month)	Down days (Per Operational Year)	% System Off-Line (Operational Year)
2013	September	UNK - BSG	0	530	530	20	20	5	5	25%
	October	UNK - BSG	74	775	10410	31	365	17	64	18%
	November	UNK - BSG		425		30		9		
	December*	42.8		250		31		11		
2014	January	6.0		2960		31		6		
	February	4.0		850		28		5		
	March	8.0		1600		31		16		
	April	8.0		1350		30		0		
	May	4.7		825		31		0		
	June	UNK - BSG		675		30		0		
	July	UNK - BSG		600		31		0		
	August	UNK - BSG		50		31		0		
	September	UNK - BSG		50		30		0		
	October	UNK - BSG	83	10	6985	31	365	0	35	--
	November	UNK - BSG		90		30		0		
	December*	45.5		75		31		0		
2015	January	5.4		75		31		17		
	February	4.3		1000		28		2		
	March	9.0		510		31		16		
	April	12.0		1795		30		0		
	May	6.8		870		31		0		
	June	UNK - BSG		400		30		0		
	July	UNK - BSG		930		31		0		
	August	UNK - BSG		500		31		0		
	September*	UNK - BSG		730		30		0		
	October	UNK - BSG	46	2140	3670	31	336	0	273	81%
	November	UNK - BSG		1050		30		0		
	December*	44.8		400		31		29		

Table 4-4
Nyacol O&M Data Summary
Nyanza Chemical Waste Dump Superfund Site
Ashland, Massachusetts
Page 2 of 2

DATE		Liquid Recovered (Gallons)		Nitrogen Consumed (PSI)		Calendar				
		Monthly	Operational Year	Monthly	Operational Year	Days (Month)	Days (Operational Year)	Down Days (Per Month)	Down days (Per Operational Year)	% System Off-Line (Operational Year)
2016	January	0.7	46	80	3670	31	336	31	273	81%
	February	0.6		0		29		29		
	March	0.0		0		31		31		
	April	0.0		0		30		30		
	May	0.0		0		31		31		
	June	0.0		0		30		30		
	July	0.0		0		31		31		
	August	0.0		0		31		31		
	September	UNK - BSG	221	225	1300	30	365	7	42	12%
	October	UNK - BSG		135		31		0		
	November	UNK - BSG		190		30		0		
	December*	61.5		50		31		0		
2017	January	12.0		110		31		0		
	February*	48.2		100		28		0		
	March	16.1		110		31		0		
	April	20.9		140		30		0		
	May	20.6		50		31		0		
	June	18.6		100		30		7		
	July	16.1		100		31		0		
	August	6.7		50		31		28		
Totals		Total DNAPL Recovered	25	Total N Tanks Used	1	Total days since system start	1451	Total days system down since start	419	29%

Notes:

1. Monthly totals are estimated values and include volumes when the readings were taken, not when actual pumping/usage occurred. (i.e. - Pumping periods that extend across month end are included in the subsequent month).

2. * Nobis makes no volume calculations when the tank volume is below the limit of the sight glass (i.e. for several O&M visits after liquid is removed from the holding tank). Tank volume is captured once liquid is visible in the sight glass - tank volume is recorded during the period that liquid becomes visible.

3. System components report system shut down due to conditions such as low battery, no power and actual tank full conditions; however system components are unable to report when a system goes off-line due to conditions such as freezing or erroneous tank full alarms. Nobis used half of the duration between site visits to estimate system down time when a previously enabled system was found to be off-line upon return.

4. Operational Year = Period Of Performance (September 1, 2016 through August 31, 2017).

5. Observations and jar testing has determined that approximately 55% of recovered liquid is a DNAPL/water emulsion. Measurable amounts of free-phase DNAPL has not been observed at Nyacol during system operation.

6. UNK - BSG = Volume in tank below limits of the sight glass. No volume calculations made.

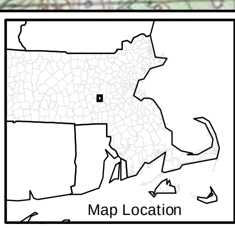
Table 4-5
Summary of System Totals - Both Locations
Nyanza Chemical Waste Dump Superfund Site
Ashland, Massachusetts

System	Total liquid recovered (gallons)	Total product recovered[4] (gallons)	Total Time Pump On (hr:min:sec)	Total Nitrogen consumed (PSI)	Number of Nitrogen Tanks Used	Maximum Carbon Drum Effluent PID Screening Value (PPM)	Number of 55-gallon Drums Generated	Total Days Since System Start	Total Days System Down Since Start	Total % System Down
WAC	1000	200	36:23:11	7200	4	3.3	1	1451	323	22%
NYACOL	423	233	6:42:38	22895	11	3.7	1	1451	419	29%
TOTAL	1423	433	43:05:49	30095	15	--	2	2902	742	26%

Notes:

1. Values are total values calculated since system start-up.
2. 55-gallon drums contain spent PPE, spill materials, and other materials contaminated by DNAPL during routine O&M activities.
3. Nitrogen tanks are 304 cubic feet, high pressure (2500 PSI) compressed gas cylinders.
4. Total time pump on is actual time the pump is displacing/lifting liquid to the collection tank.
5. Total product recovered is gallons of DNAPL for WAC and gallons of DNAPL/Water Emulsion for Nyacol. Approximately 20% of recovered liquid is free-phase DNAPL at WAC. Approximately 55% of recovered liquid is a DNAPL/water emulsion at Nyacol - Measurable amounts of free-phase DNAPL have not been observed at Nyacol during system operation.

FIGURES



USGS Topographic Map
Ashland, Massachusetts
Revised 1982

0 500 1,000 2,000
Feet
1 inch = 2,000 feet

N

Nobis
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Nobis Engineering, Inc.
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Client-Focused, Employee-Owned

FIGURE 1-1

SITE LOCUS PLAN
NYANZA CHEMICAL WASTE DUMP
SUPERFUND SITE - OPERABLE UNIT II
ASHLAND, MASSACHUSETTS

PREPARED BY: JH	CHECKED BY: JV
PROJECT NO. 800.0922	DATE: MARCH 2016

NOTES:

1. Aerial photograph derived from MassGIS.

DATE: NOVEMBER 2015
PROJECT NO. 80022
PREPARED BY: JH
CHECKED BY: JV

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NYANZA CHEMICAL WASTE DUMP
SUPERFUND SITE
OPERABLE UNIT II
ASHLAND, MASSACHUSETTS

SITE FEATURES

FIGURE
1-2

Path: R:\80000 Task Orders\80022 Nyanza OU2\Technical Data (TD)\GIS\Maps\Figure 1-2 Nyanza Site Features.mxd Date Printed: 12/9/2015

APPENDICES

APPENDIX A

BORING LOG

	Project: Nyanza Superfund Site OU2	Boring No.: **MW/B-11**
		Boring Location: Between B-8 and SB-600
Engineering a Sustainable Future	Location: Ashland, Massachusetts	Checked by: J. McCullough
	Nobis Project No.: 80022.07	Date Start: July 23, 2012
		Date Finish: July 23, 2012
Contractor: Major Drilling Group Int'l, Inc.	Rig Type / Model: Geoprobe / 8140LS	Ground Surface Elev.:
Driller: H. Huntoon	Hammer Type:	
Nobis Rep.: J. Brunelle	Hammer Hoist:	Datum: N/A

	Drilling Method	Sampler
Type	Casing	Core Barrel
Size ID (in.)	6"	
Advancement	Sonic	Push

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time

Depth (ft.)	Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	PID (ppm)	Drilling Rate (min/ft)	Ground Water	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified ASTM)	WELL DETAIL
0–1	S-1		0-9		0.4			FILL	S-1A (18"): Tan, Well-graded Sand (SW). Moist.	Completed with 3' Standpipe
2					1.2				S-1B (12"): Dark brown, Well-graded Sand with Silt and Gravel (SW-SM). Moist.	
3					0.8				S-1C (18"): Olive-brown, Well-graded Sand with Gravel (SW). Moist.	
4					1.2			/ 4.0		
5								ORGANIC DEPOSITS	S-1D (24"): Dark brownish-black, Sandy Organic Soil (OH). Moist to wet.	
6								/ 6.0		Grout to surface
7					5.8			SILT	S-1E (24"): Black, Silt (ML), wet, changing to Well-Graded Sand with Gravel (SW). Wet. DNAPL odor detected.	
8					9.6 / 26			/ 8.0		
9					30			GLACIAL TILL / 9.0	S-1F (12"): Gray, Silty Sand with Gravel (SM), 10% bedrock fragments. Dry.	
10	R-1	60	9-14			1		BEDROCK	R-1: Pink-gray Granite - quartz and biotite present. Igneous, coarse to medium grained, slightly foliated, slightly weathered at bedrock contact to fresh. Competent and strong. Wet. RQD = 55%.	
11						12				
12					0.7	14				000 Sand Filter Pack
13						7			Fracture at 13.3', fracture zone at 14'. Moderately to intensely fractured.	
14					0.8	8				
15	R-2	60	14-19			2			R-2: Pink-gray Granite - quartz and biotite present. Igneous, coarse to medium grained, slightly foliated, slightly fractured and strong. Competent. Wet. RQD = 40%.	00 Sand Filter Pack
16						4				
17						9				Screen
18						11			Black product washed up through casing with drill water.	
19						10				Void Space
20	R-3	60	19-24		3.6	26			R-3: Pink-gray Granite - quartz and biotite present. Igneous, coarse to medium grained, slightly foliated, slightly fractured and strong. Competent. Wet. RQD = 90%.	
21						10				
22					0	7			Granite vein intrusion (less biotite than rest of sample) from 19'-21.5'.	
23					0	10			Fractures at 17.9', 23.3', 23.6'.	Sump
24					0.1			/ 23.5		Bentonite Pellets Around Sump
25									Boring terminated at 23.5 feet.	

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:

Soil descriptions and gradation percentagesare based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

NYANZA II GROUNDWATER STUDY			BORING NO. B-113A
CLIENT REM III			PROJECT NO. 5331-03
CONTRACTOR ROCHESTER DRILLING CO.		DATE STARTED 3-22-88	COMPLETED 3-27-88
METHOD HSA & DRIVE CASING	CASING SIZE 6.8,6,5"	PI METER HNU 11.7 eV	PROTECTON LEVEL Mod C
ELEVATION 195.66 FT above MSL	SOIL DRILLED 43.0 FT	ROCK DRILLED 30.0 FT	W.L. BELOW GROUND 2.62 FT
LOGGED BY S. PINETTE & J. SNOWDEN	CHECKED BY CH	DATE 10/12/88	PAGE 1 OF 2

DEPTH (FT)	HNU AMB.	SAMP.# (REF. SAMPLE)	CLP	GC	INTERVAL(FT)	RECOVERY(FT)	SOIL\ROCK DESCRIPTION	SOIL CLASS	FIELD GC TOTALS (PPM)	BLOWS PER 6 INCHES				N	DEPTH (FT) WELL DATA	COMMENTS
0	BG	S-1	X	N	N	0 to 2	1.0	SAND, silty fine, with trace coarse sand and fine gravel; gap graded; loose; moist; med. yellow brown; some mottling and black staining. FILL	SM		5	4	4	3	8		3" ID ST. PROTECTIVE CASING IN GROUT CEMENT; 2" ID SS RISER
5	BG	S-2	X	N	Y	5 to 7	1.6	SAND, silty fine; over SAND, fine, with gravel; poorly graded; dense; wet; with some mottling; med. yellow-brown.	SM	ND	12	12	26	38	38		
10	BG	S-3	X	N	Y	10 to 12	1.2	SAND, silty fine, with little clay; over SAND, med. to coarse, & GRAVEL, fine; moderately graded; medium dense; wet; med. yellowish brown to light olive brown.	SM SP GP	5	6	8	8	9	16		
15	BG	S-4	X	N	Y	15 to 17	1.6	SAND, fine to coarse, and GRAVEL, fine; interbedded with SAND, fine silty, with little gravel; well graded; medium dense; wet med. brown.	SP SM	0.7	14	9	6	40	15		BENTONITE PELLET SEAL
20	BG	S-5	X	N	Y	20 to 22	1.4	SAND, silty fine, with medium to coarse sand and gravel; well graded dense; wet; medium yellowish brown.	SM	1	22	18	18	18	36	21.0	
25	BG	S-6	X	N	Y	25 to 27	1.6	SAND, silty fine; over SAND, fine to coarse, with some fine gravel; widely graded; very dense; wet; medium yellowish brown.	SM SW	10	26	27	60	74	87		
30	BG	S-7	X	N	Y	30 to 32	0.8	SAND, silty fine, with some coarse sand and little gravel; well graded; very dense; wet; medium yellowish brown. GLACIAL LACUSTRINE\FLUVIAL	SM	395	21	17	16	22	33		
35	BG	S-8	X	N	Y	35 to 36.5	0.9	SAND, medium to coarse; poorly graded; very dense; wet; medium yellowish brown. GLACIAL FLUVIAL	SP	6	26	50	108		GR		
40	BG	S-9	N	N	N	40 to 40.1		Trace sample recovery.			120 --- .1'						BENTONITE PELLET SEAL
45								BEDROCK at 43.0'								44.0	

S = SPLIT SPOON R = ROCK BG = BACKGROUND GR = N VALUE > 100

NOTES: 1. Water level measurements were performed 6\7\88.

2. FIELD GC TOTALS include concentrations of all GC target compounds

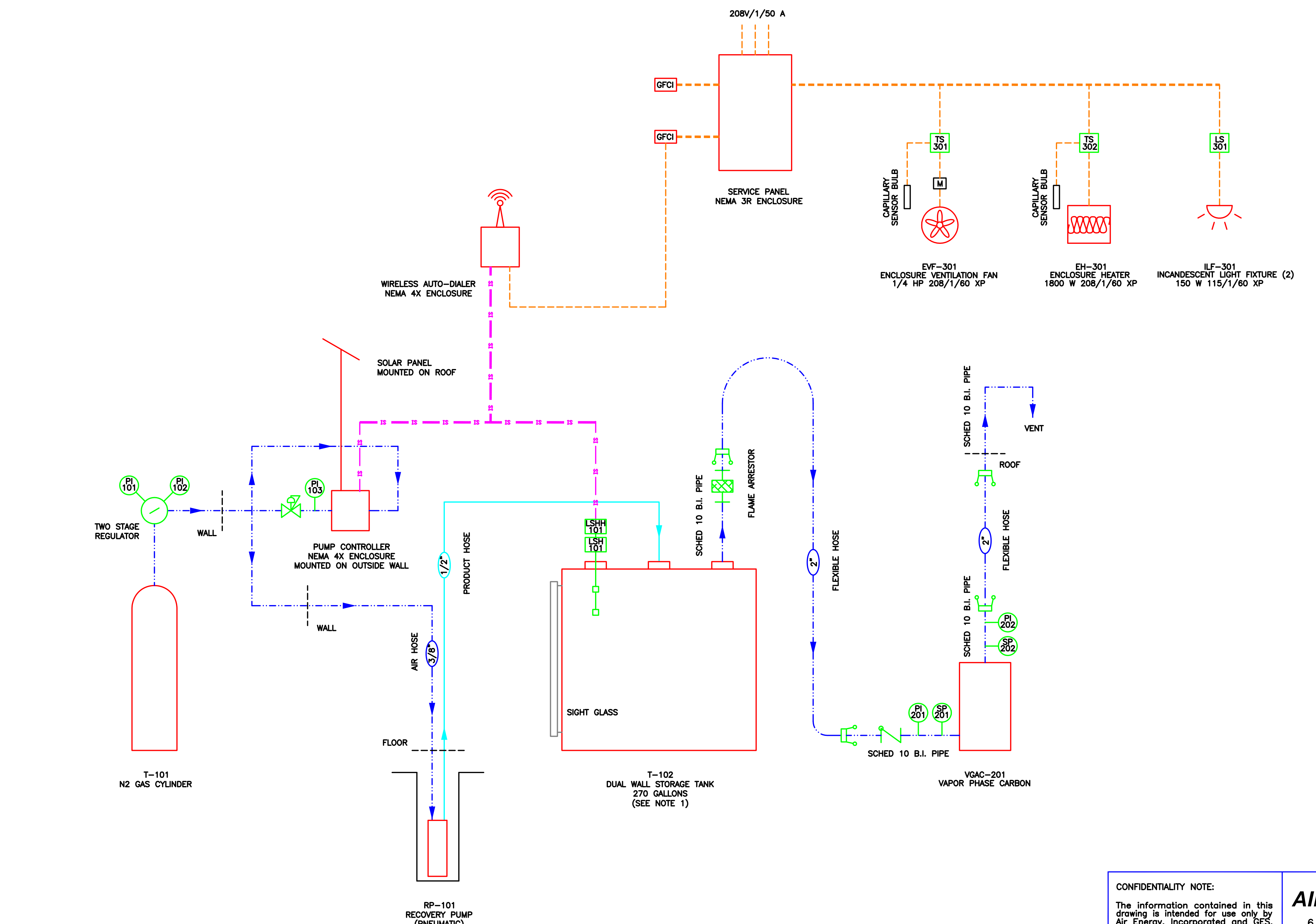
3. Pattern denotes the CLP sample(s) interval.

NYANZA II GROUNDWATER STUDY	BORING NO. B-113A
CLIENT REM III	PROJECT NO. 5331-03
	PAGE 2 OF 2

DEPTH (FT)	HNU AMB.	SAMP.#	REF.SAMPLE CLP	GC	INTERVAL(FT)	RECOVERY(FT)	SOIL\ROCK DESCRIPTION	SOIL CLASS	FIELD GC TOTALS (PPM)	BLOWS PER 6 INCHES	N	DEPTH (FT)	WELL DATA	COMMENTS
45							BEDROCK - 43.0'. Presumed Milford granite. For fracture evaluation, see Packer Test data for B-113A. Advance in bedrock: 43-46.3' 4.9" tricone bit 46.3-73' 3.9" tricone bit					46.0		2" ID SS WELL SCREEN 5' LENGTH; 0.01" SLOT SIZE
50												51.0		
55												55.0		BENTONITE PELLET SEAL
60														GRADED SAND BACKFILL
65														
70							Bottom of Exploration 73.0'					73.0		
75														
80														
85														
90														

S = SPLIT SPOON R = ROCK BG = BACKGROUND

APPENDIX B



LEGEND

GFCI	GROUND FAULT CIRCUIT INTERRUPTER
LS	LIGHT SWITCH
LSH	LEVEL SWITCH HIGH
LSHH	LEVEL SWITCH HIGH HIGH
M	MOTOR
PI	PRESSURE INDICATOR
SP	SAMPLE PORT
TS	TEMPERATURE SWITCH
	CAM LOCK FITTING
	CHECK VALVE
	PRESSURE REGULATOR
	UNION
	WIRELESS ANTENNA
	AIR LINE
	CONTROL LINE
	INTRINSICALLY SAFE LINE
	PRODUCT LINE

ALARM

1. STORAGE TANK HIGH LEVEL
2. STORAGE TANK HIGH HIGH LEVEL

NOTE:

1. 12" MANWAY & 2" PUMP OUT PORT NOT SHOWN FOR CLARITY.

REV.	DESCRIPTION	DATE	APPR.
2	GENERAL REVISION	7/24/13	PRS
1	CHANGE VOLTAGE FROM 230/3/60 TO 208/1/50 A	5/13/13	PRS

REVISIONS

CONFIDENTIALITY NOTE:

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DRWN BY PRS	DATE 5/5/2013
CHK BY	DATE
APPR BY	DATE

AIR ENERGY, INCORPORATED

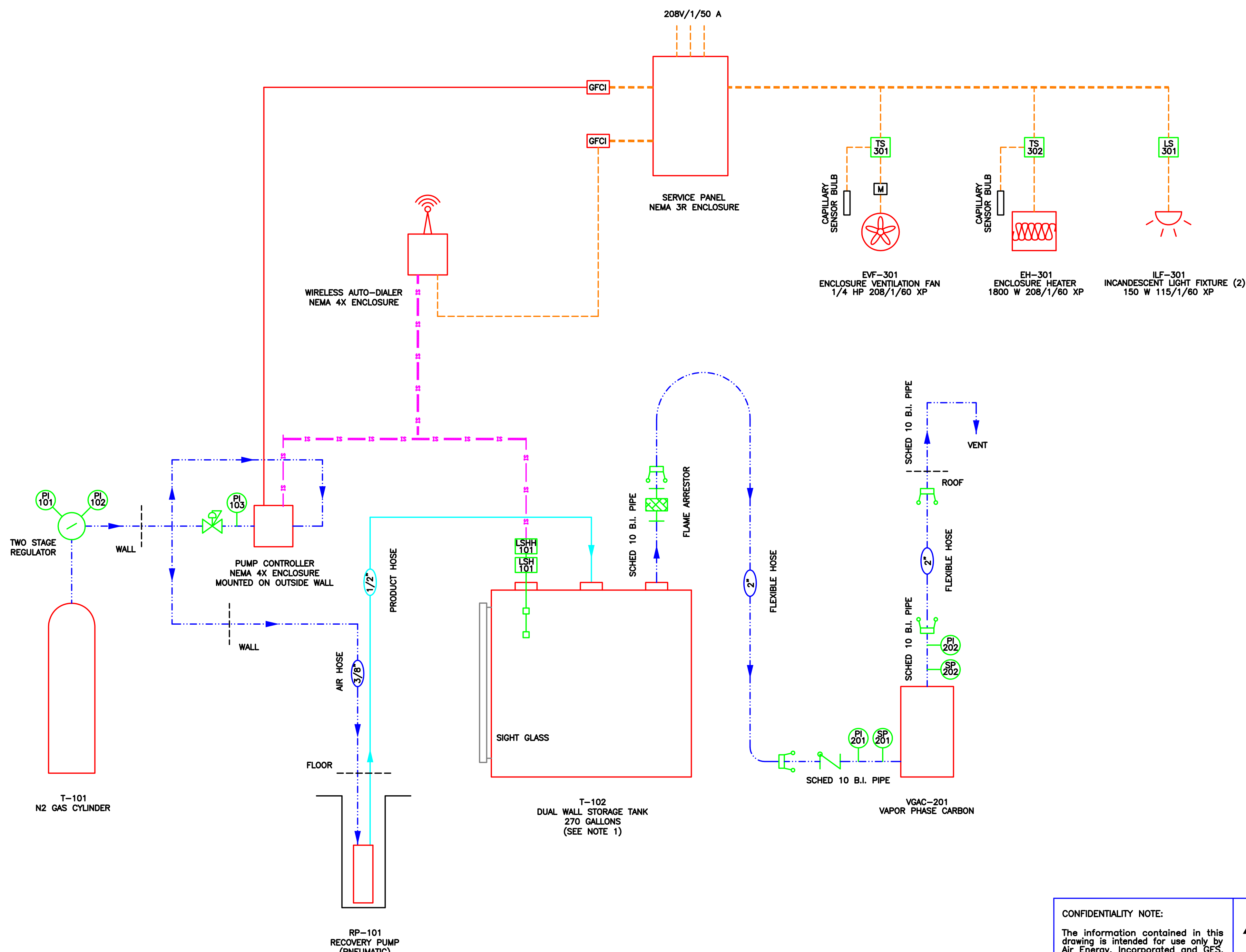
6 Norfolk Avenue – South Easton, Massachusetts
(Phone) 508-230-9445 / (Fax) 508-230-9446

TITLE
DNAPL EXTRACTION TREATMENT SYSTEM
PROCESS & INSTRUMENTATION DIAGRAM NYACOL SITE

GROUNDWATER & ENVIRONMENTAL SERVICES
NYANZA SUPERFUND SITE – ASHLAND, MA

SERIAL NO. 33320-S44

SCALE	SIZE	DWG NO.	SHEET	REV
N/A	C	33320-S44-P1	1 OF 1	2



LEGEND

GFCI	GROUND FAULT CIRCUIT INTERRUPTER
LS	LIGHT SWITCH
LSH	LEVEL SWITCH HIGH
M	MOTOR
PI	PRESSURE INDICATOR
SP	SAMPLE PORT
TS	TEMPERATURE SWITCH
	CAM LOCK FITTING
	CHECK VALVE
	PRESSURE REGULATOR
	UNION
	WIRELESS ANTENNA
	AIR LINE
	CONTROL LINE
	INTRINSICALLY SAFE LINE
	PRODUCT LINE

ALARM

1. STORAGE TANK HIGH LEVEL
2. STORAGE TANK HIGH HIGH LEVEL

NOTE:

1. 12" MANWAY & 2" PUMP OUT PORT NOT SHOWN FOR CLARITY.

REV.	DESCRIPTION	DATE	APPR.
2	GENERAL REVISION	7/24/13	PRS
1	CHANGE VOLTAGE FROM 230/3/60 TO 208/1/50 A	5/13/13	PRS

REVISIONS

CONFIDENTIALITY NOTE:

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AIR ENERGY, INCORPORATED

6 Norfolk Avenue – South Easton, Massachusetts
(Phone) 508–230–9445 / (Fax) 508–230–9446

DRWN BY: PRS	DATE: 5/5/2013
CHK BY	DATE
APPR BY	DATE

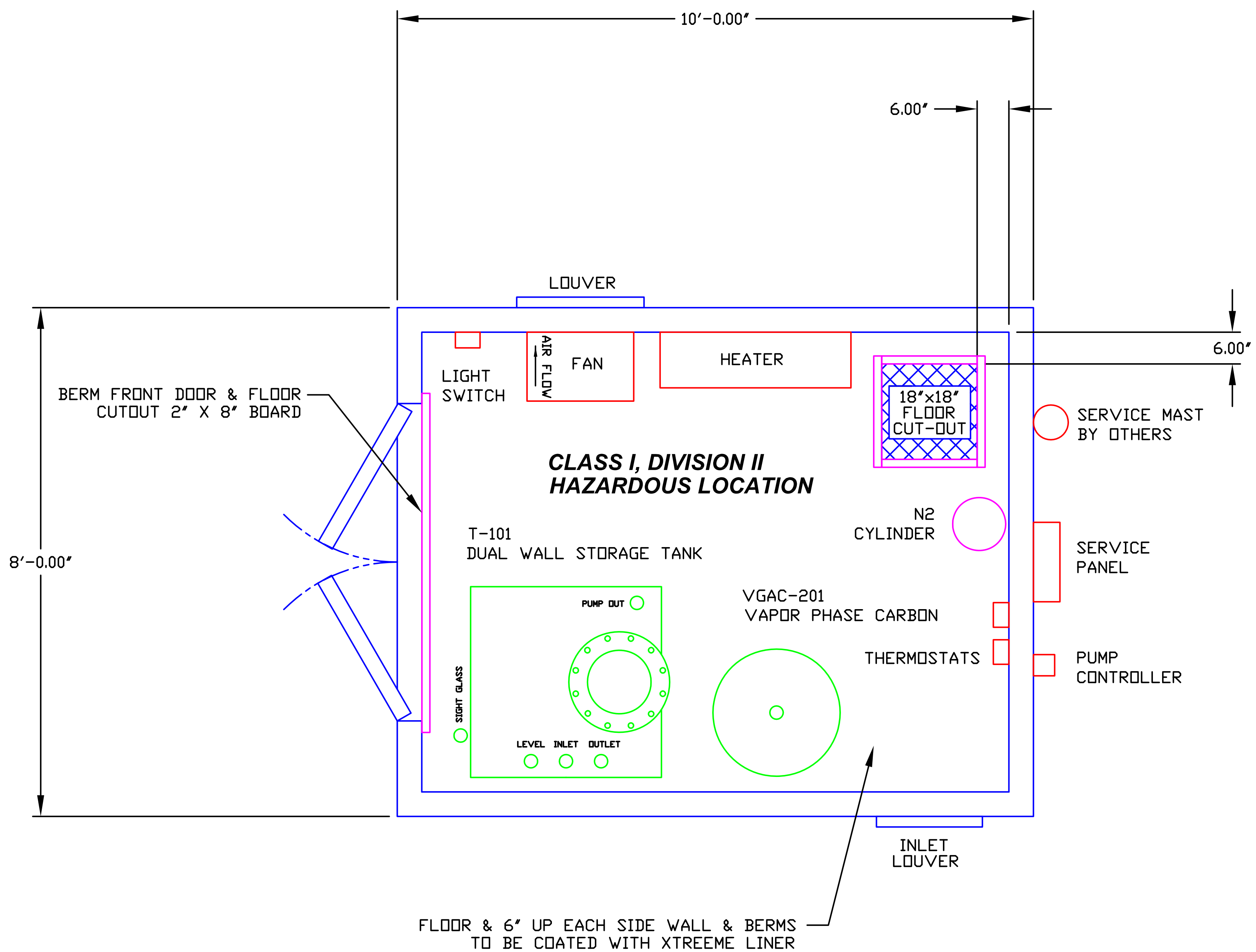
TITLE
DNAPL EXTRACTION TREATMENT SYSTEM
PROCESS & INSTRUMENTATION DIAGRAM WAC SITE

GROUNDWATER & ENVIRONMENTAL SERVICES
NYANZA SUPERFUND SITE – ASHLAND, MA

SERIAL NO. 33320–S44

SCALE	SIZE	DWG NO.	SHEET	REV
N/A	C	33320–S44–P2	1 OF 1	2

APPENDIX C



REVISIONS			
REV.	DESCRIPTION	DATE	APPR.
1	MOVE THE SERVICE MAST FROM THE SE CORNER OF THE SHED TO THE NE CORNER: MOVE THE SERVICE PANEL TO THE CENTER & THE PUMP CONTROLLER SOUTH OF THE SERVICE PANEL	5/13/13	PRS
2	MIRROR EQUIPMENT	7/12/13	PRS
3	RELOCATE FAN & THERMOSTATS: ADD BERM TO TO FRONT DOOR & FLOOR CUTOUT: ADD NOTE FOR FLOOR & WALL COATING	7/25/13	PRS

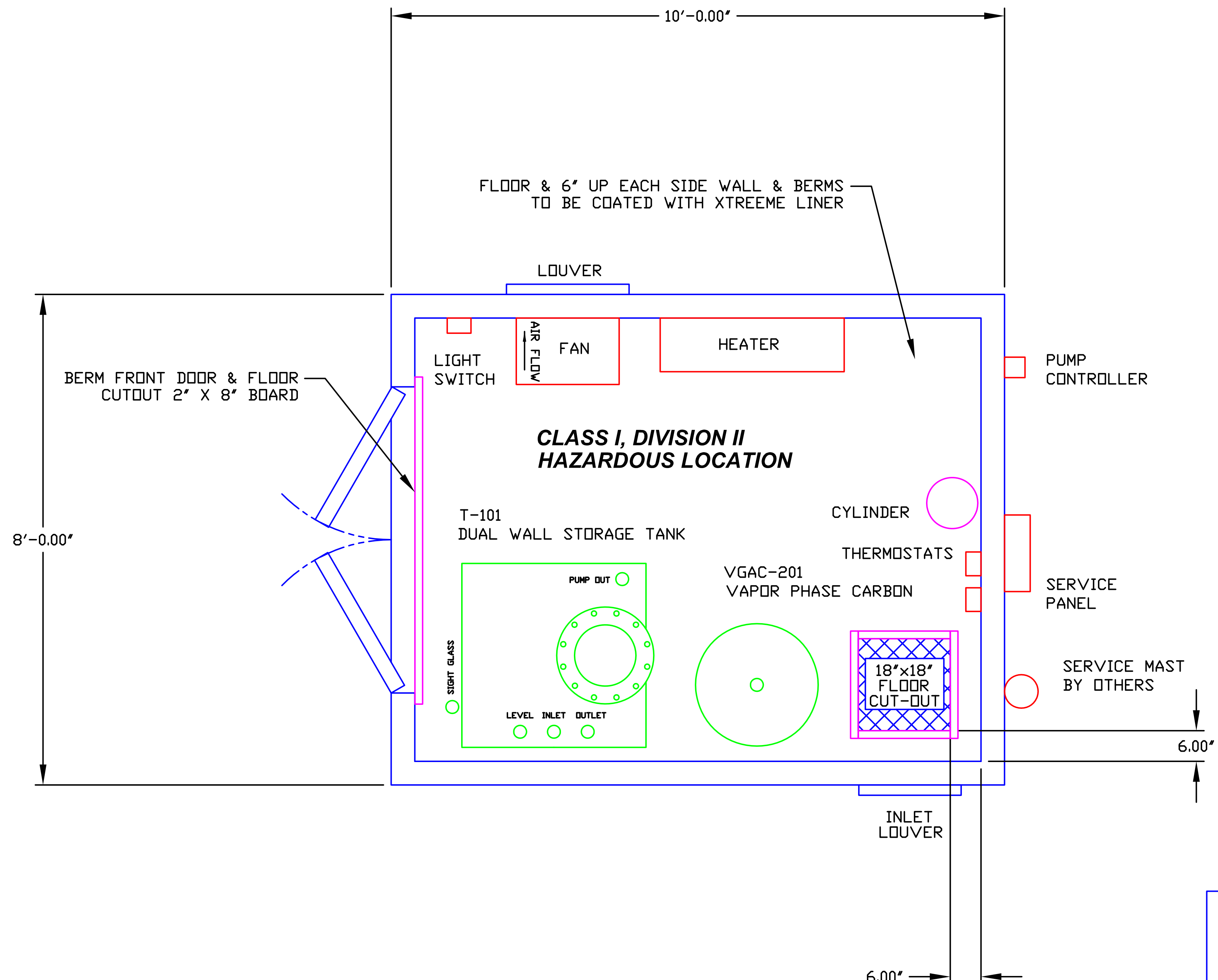
AIR ENERGY, INCORPORATED

6 Norfolk Avenue South Easton, Massachusetts 02375
Phone (508) 230-9445 Fax (508) 230-9446

TITLE
DNAPL EXTRACTION TREATMENT SYSTEM
SHED LAYOUT NYACOL SITE

DRWN BY PRS	DATE 5/2/13				
CHK BY	DATE	GROUNDWATER & ENVIRONMENTAL SERVICES NYANZA SUPERFUND SITE - ASHLAND, MA		SERIAL NO. 33320-S44	
APPR BY	DATE	SCALE 1"=30"	SIZE B	DWG NO. 33320-S44-L1	SHEET 1 OF 1 / REV 3

REVISIONS			
REV.	DESCRIPTION	DATE	APPR.
1	MOVE THE FAN FROM THE SW CORNER OF THE SHED TO THE NW CORNER	5/13/13	PRS
2	MIRROR EQUIPMENT	7/13/13	PRS
3	RELOCATE FAN & THERMOSTATS: ADD BERM TO TO FRONT DOOR & FLOOR CUTOUT: ADD NOTE FOR FLOOR & WALL COATING	7/25/13	PRS



CONFIDENTIALITY NOTE:

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AIR ENERGY, INCORPORATED

6 Norfolk Avenue South Easton, Massachusetts 02375
Phone (508) 230-9445 Fax (508) 230-9446

DRWN BY PRS	DATE 5/2/13	TITLE DNAPL EXTRACTION TREATMENT SYSTEM SHED LAYOUT WAC SITE			
CHK BY	DATE	GROUNDWATER & ENVIRONMENTAL SERVICES NYANZA SUPERFUND SITE – ASHLAND, MA		SERIAL NO. 33320-S44	
APPR BY	DATE	SCALE 1"=30"	SIZE B	DWG NO. 33320-S44-L2	SHEET 1 OF 1 / REV 3

APPENDIX D

Maintenance Schedule
Nyanza
DNAPL Extraction System
Nyanza Superfund Site
Ashland, Massachusetts

EQUIPMENT NO.	EQUIPMENT DESCRIPTION	MAINTENANCE DESCRIPTION	FREQUENCY	COMMENTS
Extraction System				
RP-101	Recovery Pump	Monitor for proper operation and performance. Inspect hoses for leaks, build-up, and clean as necessary.	6 Months or Performance Decision	
Storage System				
T-102	Storage System	Inspect site glass for signs of water or product.	Bi-weekly	
		Evaluate tank contents to determine if tank draining and cleaning is required.	After Tank T-102 cleanout	
		Drain, inspect, and clean tank. Check for leaks. Check level switches for proper installation.	After Tank T-102 cleanout or Performance Decision	
Ventilation System				
VGAC-201	GAC Unit	Check for excessive pressure build-up across vessel.	Bi-weekly	
		Replace Carbon	After PID reading of 25 PPM is indicated at GAC Unit Effluent Sample Port	
Process Control System				
NA	Autodialer	Enable Alarm to Ensure System is working correctly.	After Tank T-102 cleanout	
		Download alarm data.	Quarterly	
		Replace batteries.	3 Years	
Miscellaneous Items				
NA	Performance Evaluation	Review the last O&M Visit form and look for operating performance changes that may be caused by malfunctioning equipment.	Bi-weekly	
NA	Spill Containment	Inspect building flooring for signs of spills. Clean any spills, as necessary.	Bi-weekly	
		Inspect spill clean-up kit and replace missing supplies.	Quarterly	
ILF-301	Lighting System	Listen for abnormal noise. Change bulb if needed.	Bi-weekly	
EH-301	Heating System	Confirm unit is functioning during cold weather.	Every 3 Months	
EVF-301	Exhaust System	Listen for abnormal noise or vibration.	Every 3 Months	
NA	Solar System, *Nyacol Facility Only*	Inspect solar panel for damage. Confirm unit is functioning correctly.	Every 6 Months	

APPENDIX E

DNAPL Extraction System
Operations and Maintenance
Nyanza Superfund Site
Ashland, MA

Facility:	
Date:	
Operations Personnel:	
Other Personnel:	
Weather:	
Arrival Time:	
Departure Time:	

System Operations		
Status of DNAPL Extraction System (Conditions Observed or Concerns):		
Description of Routine Maintenance Performed:		
Description of Non-Routine Maintenance Performed:		
Description of Any Emergency Conditions Observed:		
Site Security		
Facility Locked?	Yes / No	
Trespassing Evident?	Yes / No	
Building Atmosphere		
Odor in Facility Building?	Yes / No	
PID Reading - Interior of Facility Building	(PPM)	
Intake Vent Screen Cleaned?	Yes / No	
Leak Inspection		
Any Leaks Identified?	Yes / No	
Autodialer		
Is Autodialer in Alarm?	Yes / No	

DNAPL Extraction System
Operations and Maintenance
Nyanza Superfund Site
Ashland, MA

Extraction System			
Pump Controller Readings (Prior to Enabling System/Initial Reading)		***Arrival***	***Departure***
Current Time	(HH:MM:SEC)		
Remaining Time off	(HH:MM:SEC)		
Refill Total	(HH:MM:SEC)		
Discharge Total	(HH:MM:SEC)		
On Total	(HH:MM:SEC)		
Off Total	(HH:MM:SEC)		
Electrical Meter Reading			
System Enabled?		Yes / No	Yes / No
Pump Controller Settings		***Current Settings***	***Modified Setting (if applicable)***
Refill	(HH:MM:SEC)		
Discharge	(HH:MM:SEC)		
System On	(HH:MM:SEC)		
System Off	(HH:MM:SEC)		
Nitrogen Tank Readings (After Enabling System/Final Reading)			
Nitrogen Tank (PI 101) Pressure		(PSI)	
Primary Regulator (PI 102) Pressure		(PSI)	
Secondary Regulator (PI 103) Pressure (Located Outside)		(PSI)	
Does Nitrogen Tank (PI 101) Need to be Replaced? (below 500 PSI)		Yes / No	
Was Nitrogen Tank (PI 101) Replaced?		Yes / No	Starting PSI:
Storage System			
Is Water Visible in Sight Glass?		Yes / No	
Is DNAPL Visible in Sight Glass?		Yes / No	
Sight Glass Readings			
Approximate Height of Liquid in DNAPL Tank (T-102)		(Inches)	
Approximate Volume of Liquid in DNAPL Tank (T-102) (5.35 gallons/inch)		(Gallons)	
Physical Tank Gauging (To Be Done Monthly with Tank Stick or Clear Bailer)			
Approximate Height of Liquid in DNAPL Tank [including DNAPL] (T-102)		(Inches)	
Approximate Height of DNAPL in DNAPL Tank (T-102)		(Inches)	
Ventilation System			
Vapor Phase Carbon Pressure (PI 201) Inlet		(PSI)	
Vapor Phase Carbon PID Reading (SP 201) Inlet		(PPM)	
Vapor Phase Carbon Pressure (PI 202) Outlet		(PSI)	
Vapor Phase Carbon PID Reading (SP 202) Outlet		(PPM)	
During System Operations/While Pumping			
Current Time		(HH:MM:SEC)	
Flow Visible?		Yes / No	
Nitrogen Gas Visible in Water Tubing?		Yes / No	
Any Leaks Identified?		Yes / No	
Number of Pump Cycles Manually Triggered During O&M Visit			

APPENDIX F

Alarm Notification via the Cellular Network

Logout

CELL682 Wireless Alarms SENSAPHONE® REMOTE MONITORING SOLUTIONS

Alarms | Dry Contact | Analog | Outputs | Machine-to-Machine | Notification

System Name: WAC
PIN: 2420

Programming Last Refreshed: 12:20 AM 08/04/2017 click to refresh
Last Web Programming Change: 10:30 AM 08/17/2017
Status Last Refreshed: 10:35 AM 08/17/2017 click to refresh

Alarm History

Start Date: 09/01/2016 Stop Date: 08/31/2017 Go Quick Dates

Alarm Date	Event	I/O Point	Value	Notification	Type
10:39 AM 08/17/2017	Acknowledgment Received	LSHH WAC Site	--	Contact #1:Allie Goldberg	Email
10:39 AM 08/17/2017	Message Sent	LSHH WAC Site	--	Contact #3:Allie Goldberg	Email
10:39 AM 08/17/2017	Message Sent	LSHH WAC Site	--	Contact #2:AllieGoldberg	Voice
10:38 AM 08/17/2017	Message Sent	LSHH WAC Site	--	Contact #1:Allie Goldberg	Email
10:38 AM 08/17/2017	Acknowledgment Received	LSH WAC Site	--	Contact #2:AllieGoldberg	Voice
10:38 AM 08/17/2017	Alarm Exists	LSHH WAC Site	--		
10:38 AM 08/17/2017	Message Sent	LSH WAC Site	--	Contact #3:Allie Goldberg	Email
10:37 AM 08/17/2017	Message Sent	LSH WAC Site	--	Contact #2:AllieGoldberg	Voice
10:37 AM 08/17/2017	Message Sent	LSH WAC Site	--	Contact #1:Allie Goldberg	Email
10:37 AM 08/17/2017	Alarm Exists	LSH WAC Site	--		
10:35 AM 08/17/2017	Acknowledgment Received	LSHH WAC Site	--	Webpage	Email
10:35 AM 08/17/2017	Message Sent	LSHH WAC Site	--	Contact #2:AllieGoldberg	Voice
10:35 AM 08/17/2017	Message Sent	LSHH WAC Site	--	Contact #1:Allie Goldberg	Email
10:34 AM 08/17/2017	Alarm Exists	LSHH WAC Site	--		
10:32 AM 08/17/2017	Acknowledgment Received	LSH WAC Site	--	Webpage	Email
10:32 AM 08/17/2017	Message Sent	LSH WAC Site	--	Contact #1:Allie Goldberg	Email
10:32 AM 08/17/2017	Alarm Exists	LSH WAC Site	--		
10:31 AM 08/17/2017	Acknowledgment Received	LSHH WAC Site	--	Webpage	Email
10:31 AM 08/17/2017	Message Sent	LSHH WAC Site	--	Contact #3:Allie Goldberg	Email
10:31 AM 08/17/2017	Message Sent	LSHH WAC Site	--	Contact #2:AllieGoldberg	Voice
10:30 AM 08/17/2017	Message Sent	LSHH WAC Site	--	Contact #1:Allie Goldberg	Email
10:30 AM 08/17/2017	Alarm Exists	LSHH WAC Site	--		
10:27 AM 08/17/2017	Acknowledgment Received	LSH WAC Site	--	Contact #2:AllieGoldberg	Voice
10:26 AM 08/17/2017	Message Sent	LSH WAC Site	--	Contact #3:Allie Goldberg	Email
10:26 AM 08/17/2017	Message Sent	LSH WAC Site	--	Contact #2:AllieGoldberg	Voice
10:26 AM 08/17/2017	Message Sent	LSH WAC Site	--	Contact #1:Allie Goldberg	Email
10:26 AM 08/17/2017	Alarm Exists	LSH WAC Site	--		
10:23 AM 08/17/2017	Acknowledgment Received	LSH WAC Site	--	Contact #2:AllieGoldberg	Voice
10:22 AM 08/17/2017	Message Sent	LSH WAC Site	--	Contact #3:Allie Goldberg	Email
10:22 AM 08/17/2017	Message Sent	LSH WAC Site	--	Contact #2:AllieGoldberg	Voice
10:21 AM 08/17/2017	Message Sent	LSH WAC Site	--	Contact #1:Allie Goldberg	Email
10:21 AM 08/17/2017	Alarm Exists	LSH WAC Site	--		
12:14 AM 08/04/2017	Acknowledgment Received	LSHH WAC Site	--	Contact #2:AllieGoldberg	Voice
12:13 AM 08/04/2017	Message Sent	LSHH WAC Site	--	Contact #3:Allie Goldberg	Email
12:13 AM 08/04/2017	Message Sent	LSHH WAC Site	--	Contact #2:AllieGoldberg	Voice
12:12 AM 08/04/2017	Message Sent	LSHH WAC Site	--	Contact #1:Allie Goldberg	Email
12:12 AM 08/04/2017	Alarm Exists	LSHH WAC Site	--		

12:26 PM 08/03/2017	Acknowledgment Received	LSH WAC Site	--	Contact #2:AllieGoldberg	Voice
12:25 PM 08/03/2017	Message Sent	LSH WAC Site	--	Contact #3:Allie Goldberg	Email
12:25 PM 08/03/2017	Message Sent	LSH WAC Site	--	Contact #2:AllieGoldberg	Voice
12:25 PM 08/03/2017	Message Sent	LSH WAC Site	--	Contact #1:Allie Goldberg	Email
12:24 PM 08/03/2017	Alarm Exists	LSH WAC Site	--		
12:20 PM 08/03/2017	Acknowledgment Received	LSH WAC Site	--	Contact #2:AllieGoldberg	Voice
12:19 PM 08/03/2017	Message Sent	LSH WAC Site	--	Contact #3:Allie Goldberg	Email
12:19 PM 08/03/2017	Message Sent	LSH WAC Site	--	Contact #2:AllieGoldberg	Voice
12:19 PM 08/03/2017	Message Sent	LSH WAC Site	--	Contact #1:Allie Goldberg	Email
12:19 PM 08/03/2017	Alarm Exists	LSH WAC Site	--		
12:12 PM 08/03/2017	Acknowledgment Received	LSHH WAC Site	--	Webpage	Email
12:12 PM 08/03/2017	Alarm Exists	LSHH WAC Site	--		
11:34 AM 08/03/2017	Acknowledgment Received	LSHH WAC Site	--	Contact #2:AllieGoldberg	Voice
11:33 AM 08/03/2017	Message Sent	LSHH WAC Site	--	Contact #3:Allie Goldberg	Email
11:32 AM 08/03/2017	Message Sent	LSHH WAC Site	--	Contact #2:AllieGoldberg	Voice
11:32 AM 08/03/2017	Message Sent	LSHH WAC Site	--	Contact #1:Allie Goldberg	Email
11:32 AM 08/03/2017	Alarm Exists	LSHH WAC Site	--		
1:19 PM 06/06/2017	Acknowledgment Received	LSHH WAC Site	--	Contact #1:Allie Goldberg	Email
1:19 PM 06/06/2017	Message Sent	LSHH WAC Site	--	Contact #3:Allie Goldberg	Email
1:19 PM 06/06/2017	Message Sent	LSHH WAC Site	--	Contact #2:AllieGoldberg	Voice
1:18 PM 06/06/2017	Message Sent	LSHH WAC Site	--	Contact #1:Allie Goldberg	Email
1:18 PM 06/06/2017	Alarm Exists	LSHH WAC Site	--		
1:33 PM 05/31/2017	Acknowledgment Received	LSH WAC Site	--	Contact #2:AllieGoldberg	Voice
1:32 PM 05/31/2017	Message Sent	LSH WAC Site	--	Contact #3:Allie Goldberg	Email
1:32 PM 05/31/2017	Message Sent	LSH WAC Site	--	Contact #2:AllieGoldberg	Voice
1:32 PM 05/31/2017	Message Sent	LSH WAC Site	--	Contact #1:Allie Goldberg	Email
1:31 PM 05/31/2017	Alarm Exists	LSH WAC Site	--		
2:40 PM 05/30/2017	Acknowledgment Received	LSHH WAC Site	--	Contact #2:AllieGoldberg	Voice
2:39 PM 05/30/2017	Message Sent	LSHH WAC Site	--	Contact #3:Allie Goldberg	Email
2:39 PM 05/30/2017	Message Sent	LSHH WAC Site	--	Contact #2:AllieGoldberg	Voice
2:39 PM 05/30/2017	Message Sent	LSHH WAC Site	--	Contact #1:Allie Goldberg	Email
2:38 PM 05/30/2017	Alarm Exists	LSHH WAC Site	--		

CELL682 Wireless Alarms SENSAPHONE® REMOTE MONITORING SOLUTIONS

Alarm Notification via the Cellular Network

Logout

Alarms | Dry Contact | Analog | Outputs | Machine-to-Machine | Notification

System Name: Nyacol
PIN: 2408

Programming Last Refreshed: 11:24 AM 06/06/2017 click to refresh
Last Web Programming Change: 11:23 AM 06/06/2017
Status Last Refreshed: 11:25 AM 06/06/2017 click to refresh

Alarm History

Start Date: 09/01/2016 Stop Date: 08/31/2017 Go Quick Dates

Alarm Date	Event	I/O Point	Value	Notification	Type
11:31 AM 08/17/2017	Acknowledgment Received	1	--	Contact #1:AllieGoldberg	Voice
11:30 AM 08/17/2017	Message Sent	1	--	Contact #1:AllieGoldberg	Voice
11:30 AM 08/17/2017	Alarm Exists	1	--		
11:29 AM 08/17/2017	Acknowledgment Received	2	--	Contact #1:AllieGoldberg	Voice
11:28 AM 08/17/2017	Message Sent	2	--	Contact #1:AllieGoldberg	Voice
11:28 AM 08/17/2017	Alarm Exists	2	--		
11:23 AM 06/06/2017	Acknowledgment Received	2	--	Webpage	Email
11:21 AM 06/06/2017	Message Sent	2	--	Contact #1:AllieGoldberg	Voice
11:21 AM 06/06/2017	Alarm Exists	2	--		
5:01 AM 06/01/2017	Acknowledgment Received	2	--	Contact #1:AllieGoldberg	Voice
4:59 AM 06/01/2017	Message Sent	2	--	Contact #1:AllieGoldberg	Voice
4:59 AM 06/01/2017	Alarm Exists	2	--		
5:00 PM 05/31/2017	Acknowledgment Received	LSHH WAC SITE	--	Automatic	Email
1:25 PM 05/31/2017	Acknowledgment Received	1	--	Contact #7:Jim Vernon	Email
1:24 PM 05/31/2017	Message Sent	1	--	Contact #8:JimVernon	Voice
1:24 PM 05/31/2017	Message Sent	1	--	Contact #7:Jim Vernon	Email
1:24 PM 05/31/2017	Alarm Exists	1	--		
1:21 PM 05/31/2017	Acknowledgment Received	2	--	Contact #7:Jim Vernon	Email
1:16 PM 05/31/2017	Message Sent	2	--	Contact #8:JimVernon	Voice
1:16 PM 05/31/2017	Message Sent	2	--	Contact #7:Jim Vernon	Email
1:16 PM 05/31/2017	Alarm Exists	2	--		
3:36 PM 05/30/2017	Acknowledgment Received	1	--	Automatic	Email
3:35 PM 05/30/2017	Alarm Exists	1	--		
3:25 PM 05/30/2017	Acknowledgment Received	1	--	Automatic	Email
3:24 PM 05/30/2017	Alarm Exists	1	--		
6:47 PM 09/07/2016	Acknowledgment Received	LSHH WAC SITE	--	Automatic	Email

Terms and Conditions

APPENDIX G

Please print or type. (Form designed for use on elite (12-pitch) typewriter.) Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator ID Number	MAD990685422
2. Page 1 of	1
3. Emergency Response Phone	800 698-1865
4. Manifest Tracking Number	016972651 JJK

GENERATOR

5. Generator's Name and Mailing Address
Nyanza Chemical Waste Dump Superfund Site
Megunko Road
Ashland MA 01721

Generator's Site Address (if different than mailing address)

Generator's Phone: 617 918-1327

6. Transporter 1 Company Name: New England Disposal Technologies, Inc. — U.S. EPA ID Number: MAC300008059

7. Transporter 2 Company Name — U.S. EPA ID Number

8. Designated Facility Name and Site Address
Clean Harbors of Braintree, Inc.
1 Hill Avenue
Braintree MA 02184
Facility's Phone: 781 380-7100

U.S. EPA ID Number: MAD053452637

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes
X	1. RQ UN3082, WASTE Environmentally hazardous substances, liquid, n.o.s. (dichlorobenzene, trichloroethylene) 9, PGIII	001	TT	207	G	D021 D027 D036 D040
	2.					
	3.					
	4.					

14. Special Handling Instructions and Additional Information
1)CH804730 ERG#171

Sales Order #1700134729

15. **GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name	Signature	Month	Day	Year
Evan Redonnet on behalf of US EPA [illegible]	[signature]	[illegible]	[illegible]	17

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter signature (for exports only): Date leaving U.S.:

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials

	Printed/Typed Name	Signature	Month	Day	Year
Transporter 1	Shu [illegible]	[signature]	[illegible]	[illegible]	17
Transporter 2					

DESIGNATED FACILITY

18. Discrepancy
18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection
Manifest Reference Number:

18b. Alternate Facility (or Generator) — U.S. EPA ID Number
Facility's Phone:

18c. Signature of Alternate Facility (or Generator) — Month Day Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)
1. 2. 3. 4.

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a

Printed/Typed Name	Signature	Month	Day	Year

EPA Form 8700-22 (Rev. 3-05) Previous editions are obsolete.

GENERATOR'S INITIAL COPY

Job # 07-18835

Day & Date Monday 1/16/17

Contact Person Jim Vernon

Telephone 603-513-7331

Client Nobis Engineering

Billing Address 18 Chanell Dr.
Concord MA 03301

Attn:

NEDT® NEW ENGLAND DISPOSAL TECHNOLOGIES, INC.
83 Gilmore Drive • Sutton, MA 01590
Tel: (508) 234-4440 Fax: (508) 234-4441
www.NEDTINC.com

Start Time 830 Stop Time

Job Location Nyanza
Maskunko Rd
Ashland, MA

Site Contact Person Jeff or Evan

Phone Cell 781-983-0916

LABOR:

NAME	TITLE	ST	OT
	Supervisor		
	Foreman		
	Field Chemist		
Shaun Kelly	Eq. Op.		
	Eq. Op.		
	Eq. Op.		
	Eq. Op.		
	Eq. Op.		
	Field Technician		
	Field Technician		
	Field Technician		
	Field Technician		
	Field Technician		
	Field Technician		
	Field Technician		

MATERIAL:

QTY	DESCRIPTION	QTY	DESCRIPTION
	Level B PPE		Roll Off Liner
	Level C PPE		Poly Bags
	Modified Level D PPE		Bags Vermiculite
	Speedi Dry		5 Gallon Pail
	Sorbent Pads Bale		15 Gallon Drum
	Sorbent Boom Bale		30 Gallon Drum
	Flex Hose 4" 6"		55 Gallon Drum
	Fill Material		Overpack Drum
			Poly Sheeting

EQUIPMENT:

QTY		Fleet#	HRS.
	Service Trucks		
	Chemist Support Van		
	Box Truck with Liftgate		
	Dump Truck		
	Roll Off Truck		
	Roll Off Truck		
	Roll Off Trailer		
	Roll Off Trailer		
	Roll Off Container #		
	Roll Off Container #		
	Roll Off Container #		
	Roll Off Container #		
	Roll Off Container #		
1	Vacuum Tank Truck	273	
	Vacuum Trailer		
	Tractor		
	Vactor		
	Dump Trailer		
	Lowbed Trailer		
	Bobcat		
	Excavator ❑ SM ❑ LG		
	Backhoe		
	Utility Trailer		
	Confined Space Rescue Set		
	Meter ❑ 4 Gas ❑ PID		
	Compressor/Blower		
	Sawzall ❑ Cutoff ❑		
	Generator		
	Pressure Washer		
	Demo Hammer		
	Cascade Air Line System		
	Pumps		
	Emergency Response Trailer		
	Drum Loader		
	Vibrating Compactor		
	Power Broom		
	Miscellaneous Tools & Disposables		
	Police Detail		

DISPOSAL: on site 9:30AM

FACILITY	QTY./DESC.	MANIFEST #
Clean Harbors	207 gal	016972651JJK

JOB DESCRIPTION:

Pump DNAPL from tanks
& deliver to Clean HARBORS
* Need Respirator
* Truck & Hoses need to be washed out into drums.

Customer Signature: GMW on behalf of USA EPA region 1 Date 1/16/17

NEDT Rep.: Date

Comments:

CLEAN HARBORS ENVIRONMENTAL SERVICES, INC.
LAND DISPOSAL RESTRICTION FORM LDR-1

MANIFEST NO 016972651 JJK

THE HAZARDOUS WASTES IDENTIFIED ON THE HAZARDOUS WASTE MANIFEST IDENTIFIED ABOVE AND BEARING THE EPA HAZARDOUS WASTE CODES LISTED BELOW ARE RESTRICTED WASTES WHICH ARE PROHIBITED FROM LAND DISPOSAL WITHOUT FURTHER TREATMENT UNDER THE LAND DISPOSAL RESTRICTIONS, 40 CFR PART 268 .7 (a)(2), AND RCRA SECTION 3004(D). IN ACCORDANCE WITH 40 CFR 268.7(a), THE EPA WASTE CODE, WASTE SUBCATEGORY, AND TREATABILITY GROUPS, AS APPLICABLE, ARE INCLUDED BELOW.

INSTRUCTIONS -- COMPLETE ALL SECTIONS. REFER TO PAGE 3 OF THIS FORM FOR KEY TERMS/DEFINITIONS.

Column 1 - Line Item: Enter the manifest line item number (e.g., 11a) that corresponds to the waste code(s).
Column 2 - Waste Codes/Subcategory: Check off all applicable waste codes. For D001 through D043, also check applicable subcategory; for F001 through F005, check applicable constituents.
Column 3 - Wastewater/Non-wastewater: Check off "WW" for wastewater and "Non-WW" for non-wastewaters.
Column 4 - LDR Handling Code: Circle the appropriate handling code, as follows:

1 = The waste is a characteristic hazardous waste D001, D002, D003, D004-D011, or D018-43 which is intended for treatment/disposal in a CWA system, CWA-equivalent system, or Class I SDWA system. Underlying Hazardous Constituents (UHC's) are NOT required to be identified.

1A = The waste is a characteristic hazardous waste D001 High TOC Ignitable Liquids Subcategory (i.e., greater than or equal to 10% TOC). Pursuant to 40 CFR 268.40, the waste must be treated using organic recovery (RORGS) or combustion (CMBST) technology. UHC's are NOT required to be identified.

2 = The waste is a characteristic hazardous waste D001 (other than High TOC Ignitable Liquids), D002, D003 Explosive, Water Reactive or Other Reactive subcategory, D004-D011, D012-17 non-wastewater, or D018-43 which is intended for treatment/disposal in a non-CWA system, non-CWA-equivalent system, or non-Class I SDWA system located in the United States. All UHC's which are reasonably expected to be present must be identified, except for D001 waste that is intended to be treated using organic recovery (RORGS) or combustion (CMBST) technologies. Identify UHC's by completing Sections I and IV of CHI Form LDR-1 Addendum and attach completed Addendum to this form.

3 = The waste is a characteristic (i.e., D-code) or listed (i.e., F-, K-, U-, or P-code) hazardous waste which is intended for export and treatment/disposal at a facility located outside the United States. LDR treatment standards do not apply to hazardous waste treated/disposed in a foreign country, and per USEPA guidance, the identification of UHC's (if applicable) is not required for hazardous waste that is intended to be exported. Note however that if the exported waste is subsequently returned for treatment/disposal in the United States, all applicable LDR regulations would apply and a revised LDR notification would be required.

4 = The waste meets the definition of hazardous debris pursuant to 40 CFR 268.2(h) and is intended for treatment/ disposal in compliance with the alternate debris treatment technologies of 40 CFR 268.45. In accordance with the requirements of 40 CFR 268.7(a)(2) : the contaminants subject to treatment (CSTT's) must be identified as part of this notification. Identify CSTT's by completing Section III and IV of the CHI Form LDR-1 Addendum and attach completed Addendum to this form. These constituents are being treated to comply with 40 CFR 268.45.

5 = The waste is a characteristic waste D003 Reactive Sulfide, Reactive Cyanide, or Unexploded Ordnance subcategory, a characteristic waste D012- 17 wastewater, or a listed (i.e., F-, K-, U-, or P-code) hazardous waste. UHC's are NOT required to be identified.

6 = The waste is a lab pack that is intended for incineration using the alternative lab pack treatment standard under 40 CFR 268.42(c). UHC's are NOT required to be identified; however, the generator must complete and attach the lab pack certification statement on CHI Form LDR-LP. Note that in accordance with 40 CFR Part 268 Appendix IV, lab packs which contain waste codes D009, F019, K003, K004, K005, K006, K062, K071, K100, K106, P010, P011, P012, P076, P078, U134, and U151 are not eligible for alternative lab pack treatment standard.

*** **NOTE: IF THE WASTE IS A SOIL CONTAMINATED WITH A LISTED OR CHARACTERISTIC WASTE AND THE GENERATOR WANTS TO USE THE ALTERNATE TREATMENT STANDARD FOR SOILS, CONTACT CORPORATE COMPLIANCE FOR THE APPROPRIATE LDR NOTIFICATION FORM.**

SECTION I. CHARACTERISTIC WASTES D001 THROUGH D043

COLUMN 1: LINE ITEM SEE MANIFEST	COLUMN 2: WASTE CODE / SUBCATEGORY	COLUMN 3: WASTEWATER/ NON-WASTEWATER	COLUMN 4: HANDLING CODE
________	[ ] D001 Ignitables, except High TOC subcategory	[ ] WW [ ] Non-WW	1 2 3 4 6
________	[ ] D001 High TOC Ignitable Liquids Subcategory (Greater than or equal to 10% TOC)	[ ] Non-WW only	1A 3 6
________	[ ] D002 Corrosives	[ ] WW [ ] Non-WW	1 2 3 4 6
________	[ ] D003		
	[ ] Reactive Sulfide, per 261.23 (a)(5)	[ ] WW [ ] Non-WW	1 3 4 5 6
	[ ] Reactive Cyanide, per 261.23(a)(5)	[ ] WW [ ] Non-WW	1 3 4 5 6
	[ ] Explosive, per 261.23(a)(6), (7) & (8)	[ ] WW [ ] Non-WW	1 2 3 4 6
	[ ] Water Reactive, per 261.23(a)(2), (3) & (4)	[ ] Non-WW only	1 2 3 4 6
	[ ] Other Reactive, per 261.23(a)(1)	[ ] WW [ ] Non-WW	1 2 3 4 6
	[ ] Unexploded Ordnance, Emergency Response	[ ] WW [ ] Non-WW	1 3 4 5 6
________	[ ] D004 Arsenic	[ ] WW [ ] Non-WW	1 2 3 4 6
________	[ ] D005 Barium	[ ] WW [ ] Non-WW	1 2 3 4 6
________	[ ] D006		
	[ ] Cadmium	[ ] WW [ ] Non-WW	1 2 3 4 6
	[ ] Cadmium Containing Batteries	[ ] Non-WW only	2 3 6
________	[ ] D007 Chromium	[ ] WW [ ] Non-WW	1 2 3 4 6
________	[ ] D008		
	[ ] Lead	[ ] WW [ ] Non-WW	1 2 3 4 6
	[ ] Lead Acid Batteries	[ ] Non-WW only	2 3 6

CLEAN HARBORS ENVIRONMENTAL SERVICES, INC.
LAND DISPOSAL RESTRICTION FORM LDR-1

MANIFEST NO 016972651 JJK

SECTION I. CHARACTERISTIC WASTES D001-43 (CONTINUED)

COLUMN 1: LINE ITEM SEE MANIFEST	COLUMN 2: WASTE CODE / SUBCATEGORY	COLUMN 3: WASTEWATER/ NON-WASTEWATER	COLUMN 4: HANDLING CODE
____	[ ] D009		
	[ ] Low Mercury, less than 260 mg/kg Mercury	[ ] WW [ ] Non-WW	1 2 3 4
	[ ] High Mercury Organic Subcategory	[ ] Non-WW only	2 3 4
	[ ] High Mercury Inorganic Subcategory	[ ] Non-WW only	2 3 4
____	[ ] D010 Selenium	[ ] WW [ ] Non-WW	1 2 3 4 6
____	[ ] D011 Silver	[ ] WW [ ] Non-WW	1 2 3 4 6
____	[ ] D012 Endrin	[ ] WW [ ] Non-WW	2 3 4 5 6
____	[ ] D013 Lindane	[ ] WW [ ] Non-WW	2 3 4 5 6
____	[ ] D014 Methoxychlor	[ ] WW [ ] Non-WW	2 3 4 5 6
____	[ ] D015 Toxaphene	[ ] WW [ ] Non-WW	2 3 4 5 6
____	[ ] D016 2,4-D	[ ] WW [ ] Non-WW	2 3 4 5 6
____	[ ] D017 2,4,5-TP (Silvex)	[ ] WW [ ] Non-WW	2 3 4 5 6
____	[ ] D018 Benzene	[ ] WW [ ] Non-WW	1 2 3 4 6
____	[ ] D019 Carbon tetrachloride	[ ] WW [ ] Non-WW	1 2 3 4 6
____	[ ] D020 Chlordane	[ ] WW [ ] Non-WW	1 2 3 4 6
*1	[X] D021 Chlorobenzene	[ ] WW [X] Non-WW	1 2 3 4 6
____	[ ] D022 Chloroform	[ ] WW [ ] Non-WW	1 2 3 4 6
____	[ ] D023 o-Cresol	[ ] WW [ ] Non-WW	1 2 3 4 6
____	[ ] D024 m-Cresol	[ ] WW [ ] Non-WW	1 2 3 4 6
____	[ ] D025 p-Cresol	[ ] WW [ ] Non-WW	1 2 3 4 6
____	[ ] D026 Cresol	[ ] WW [ ] Non-WW	1 2 3 4 6
*1	[X] D027 1,4-Dichlorobenzene	[ ] WW [X] Non-WW	1 2 3 4 6
____	[ ] D028 1,2-Dichloroethane	[ ] WW [ ] Non-WW	1 2 3 4 6
____	[ ] D029 1,1-Dichloroethylene	[ ] WW [ ] Non-WW	1 2 3 4 6
____	[ ] D030 2,4-Dinitrotoluene	[ ] WW [ ] Non-WW	1 2 3 4 6
____	[ ] D031 Heptachlor (and its epoxide)	[ ] WW [ ] Non-WW	1 2 3 4 6
____	[ ] D032 Hexachlorobenzene	[ ] WW [ ] Non-WW	1 2 3 4 6
____	[ ] D033 Hexachlorobutadiene	[ ] WW [ ] Non-WW	1 2 3 4 6
____	[ ] D034 Hexachloroethane	[ ] WW [ ] Non-WW	1 2 3 4 6
____	[ ] D035 Methyl ethyl ketone	[ ] WW [ ] Non-WW	1 2 3 4 6
*1	[X] D036 Nitrobenzene	[ ] WW [X] Non-WW	1 2 3 4 6
____	[ ] D037 Pentachlorophenol	[ ] WW [ ] Non-WW	1 2 3 4 6
____	[ ] D038 Pyridine	[ ] WW [ ] Non-WW	1 2 3 4 6
____	[ ] D039 Tetrachloroethylene	[ ] WW [ ] Non-WW	1 2 3 4 6
*1	[X] D040 Trichloroethylene	[ ] WW [X] Non-WW	1 2 3 4 6
____	[ ] D041 2,4,5-Trichlorophenol	[ ] WW [ ] Non-WW	1 2 3 4 6
____	[ ] D042 2,4,6-Trichlorophenol	[ ] WW [ ] Non-WW	1 2 3 4 6
____	[ ] D043 Vinyl Chloride	[ ] WW [ ] Non-WW	1 2 3 4 6

SECTION II. SPENT SOLVENT WASTES F001 THROUGH F005

COLUMN 1: LINE ITEM SEE MANIFEST	COLUMN 2: WASTE CODE / SUBCATEGORY	COLUMN 3: WASTEWATER/ NON-WASTEWATER	COLUMN 4: HANDLING CODE
____	[ ] F001 [ ] F002 [ ] F003 [ ] F004 [ ] F005	[ ] WW [ ] Non-WW	3 4 5 6

____ [ ] 1. ALL F001-F005
____ [ ] 2. Acetone
____ [ ] 3. Benzene
____ [ ] 4. n-Butyl alcohol
____ [ ] 5. Carbon disulfide
____ [ ] 6. Carbon tetrachloride
____ [ ] 7. Chlorobenzene
____ [ ] 8. o-Cresol
____ [ ] 9. m-Cresol (difficult to distinguish from p-cresol)
____ [ ] 10. p-Cresol (difficult to distinguish from m-cresol)
____ [ ] 11. Cresol - mixed isomers (sum of o-, m- and p-cresol)
____ [ ] 12. Cyclohexanone
____ [ ] 13. o-Dichlorobenzene
____ [ ] 14. 2-Ethoxyethanol (F005 only)
____ [ ] 15. Ethyl acetate
____ [ ] 16. Ethyl benzene
____ [ ] 17. Ethyl ether
____ [ ] 18. Isobutyl alcohol
____ [ ] 19. Methanol
____ [ ] 20. Methylene chloride
____ [ ] 21. Methyl ethyl ketone
____ [ ] 22. Methyl isobutyl ketone
____ [ ] 23. Nitrobenzene
____ [ ] 24. 2-Nitropropane (F005 only)
____ [ ] 25. Pyridine
____ [ ] 26. Tetrachloroethylene
____ [ ] 27. Toluene
____ [ ] 28. 1,1,1-Trichloroethane
____ [ ] 29. 1,1,2-Trichloroethane
____ [ ] 30. Trichloroethylene
____ [ ] 31. 1,1,2-Trichloro-1,2,2-trifluoroethane
____ [ ] 32. Trichloromonofluoromethane
____ [ ] 33. Xylene - mixed isomers (sum of o-, m-, and p-xylene)

CLEAN HARBORS ENVIRONMENTAL SERVICES, INC.
LAND DISPOSAL RESTRICTION FORM LDR-1

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SECTION III. CALIFORNIA LIST WASTES

COLUMN 1: LINE ITEM SEE MANIFEST	COLUMN 2: WASTE CODE / SUBCATEGORY	COLUMN 3: WASTEWATER/ NON-WASTEWATER	COLUMN 4: HANDLING CODE
______	Hazardous waste containing one or more of the following California List constituents:	[ ] WW [ ] Non-WW	1 2 3 4 6

[ ] ALL CALIFORNIA LIST CONSTITUENTS
[ ] Liquids with nickel greater than or equal to 134 mg/l
[ ] Liquids with thallium greater than or equal to 130 mg/l
[ ] Liquids with PCB's > or = 50 ppm
[ ] Waste containing HOC's > or = 1,000 mg/kg

SECTION IV. OTHER LISTED WASTES (F006-12, F019-F028, F037-38, F039, K-, U-, AND P-CODES)

COLUMN 1: LINE ITEM SEE MANIFEST	COLUMN 2: WASTE CODE / SUBCATEGORY	COLUMN 3: WASTEWATER/ NON-WASTEWATER	COLUMN 4: HANDLING CODE
______	______	[ ] WW [ ] Non-WW	3 4 5 6
______	______	[ ] WW [ ] Non-WW	3 4 5 6
______	______	[ ] WW [ ] Non-WW	3 4 5 6
______	______	[ ] WW [ ] Non-WW	3 4 5 6
______	______	[ ] WW [ ] Non-WW	3 4 5 6

[ ] CHECK HERE IF ADDITIONAL LISTED WASTE CODES ARE PRESENT. COMPLETE AND ATTACH LDR-1 CONTINUATION SHEET.
[ ] CHECK HERE IF WASTE CODE F039 (MULTISOURCE LEACHATE) IS PRESENT. IDENTIFY F039 CONSTITUENTS BY COMPLETING SECTIONS II AND IV OF CHI FORM LDR-1 ADDENDUM AND ATTACH COMPLETED ADDENDUM TO THIS FORM.

SECTION V. CONTACT NAME AND DATE

Print Name: ______________________ Date: ______________________

KEY TERMS/DEFINITIONS

CLASS I SDWA SYSTEM means a Class I deep well facility regulated under the Safe Drinking Water Act (SDWA).

CWA SYSTEM means a centralized wastewater treatment facility discharging under a Clean Water Act (CWA) permit. For example, a CWA facility would treat organic or inorganic aqueous wastes and discharge the treated effluent to the local sewer system. Examples of CWA treatment systems owned and operated by Clean Harbors include the wastewater treatment operations at Baltimore (including the CES system), Bristol, Chicago, Cincinnati and Cleveland.

CWA-EQUIVALENT SYSTEM means a "zero discharge system" that engages in "CWA-equivalent" treatment before land disposal. Zero-discharge facilities treat hazardous wastes using "CWA-equivalent" treatment methods, but do not discharge the treatment effluent to a sewer or water body (e.g., spray irrigation land farm). "CWA-equivalent" treatment methods means biological treatment for organics, alkaline chlorination, or ferrous sulfate precipitation for cyanide, precipitation/ sedimentation for metals, reduction of hexavalent chromium, or other treatment technology that can be demonstrated to perform equally or greater than these technologies.

HIGH TOC IGNITABLE LIQUIDS SUBCATEGORY means an ignitable liquid hazardous waste (waste code D001) which contains greater than or equal to 10% total organic carbon (TOC). Pursuant to 40 CFR 268.40, such wastes must be treated using organic recovery (RORGS) or combustion (CMBST) technology. Examples of RORGS technologies include the CES unit at Clean Harbors of Baltimore. Examples of CMBST technologies include hazardous waste fuel blending and subsequent reuse at a cement kiln, or destruction at a RCRA incinerator.

WASTEWATERS are wastes that contain less than 1% by weight total organic carbon (TOC) and less than 1% by weight total suspended solids (TSS). [See 40 CFR 268.2(f)]

CLEAN HARBORS ENVIRONMENTAL SERVICES, INC.
LAND DISPOSAL RESTRICTION NOTIFICATION FORM LDR-1 ADDENDUM Manifest No. 016972651 JJK

SECTION I. UNDERLYING HAZARDOUS CONSTITUENTS (UHC'S)

[X] Check here if one or more of the constituents listed in Section IV below are reasonably expected to be present as an "Underlying Hazardous Constituent" in the waste. Then in Section IV, check off each constituent. Note that per the definition of UHC in 40 CFR 268.2, fluoride, selenium, sulfides, vanadium and zinc are NOT regulated as UHC's.

[ ] Check here if NONE of the UHC constituents listed in Section IV are expected to be present in the waste.

SECTION II. MULTI-SOURCE LEACHATE (WASTE CODE F039)

[ ] Check here if one or more of the constituents listed in Section IV are present as a constituent in the multi-source leachate (F039) waste. Then in Section IV below, check off each constituent. Note that constituents which are identified by an asterisk (*) are NOT regulated as F039 constituents.

[ ] Check here if NONE of the F039 constituents listed in Section IV are present in the waste.

SECTION III. HAZARDOUS DEBRIS CONTAMINANTS SUBJECT TO TREATMENT (CSTT)

[ ] Check here if one or more of the constituents listed in Section IV is a CSTT for hazardous debris that is intended for treatment using the alternate treatment technologies in 40 CFR 268.45. To identify CSTT's, refer to the "Regulated Hazardous Constituent" column in the Treatment Standard Table in 40 CFR 268.40. Then, in Section IV below, check off the constituents that appear for each waste code used to identify the debris.

[ ] Check here if the entry in the "Regulated Hazardous Constituent" column in the Treatment Standard Table in 40 CFR 268.40 is "Not Applicable", i.e. D001, D002, and D003 (non-cyanides subcategories only).

SECTION IV. LIST OF CONSTITUENTS - INCLUDE MANIFEST LINE ITEM

34._____ [ ] Acenaphthylene
35._____ [ ] Acenaphthene
36._____ [ ] Acetone
37._____ [ ] Acetonitrile
38._____ [ ] Acetophenone
39._____ [ ] 2-Acetylaminofluorene
40._____ [ ] Acrolein
41._____ [ ] Acrylamide (*)
42._____ [ ] Acrylonitrile
251._____ [ ] Aldicarb sulfone (*)
43._____ [ ] Aldrin
44._____ [ ] 4-Aminobiphenyl
45. #1 [X] Aniline
46._____ [ ] Anthracene
47._____ [ ] Antimony
48._____ [ ] Aramite
49._____ [ ] Arsenic
50._____ [ ] alpha-BHC
51._____ [ ] beta-BHC
52._____ [ ] delta-BHC
53._____ [ ] gamma-BHC
252._____ [ ] Barban (*)
54._____ [ ] Barium
253._____ [ ] Bendiocarb (*)
255._____ [ ] Benomyl (*)
55._____ [ ] Benzene
56._____ [ ] Benz(a)anthracene
57._____ [ ] Benzal chloride (*)
58._____ [ ] Benzo(b)fluoranthene (difficult to distinguish from Benzo(k)fluoranthene)
59._____ [ ] Benzo(k)fluoranthene (difficult to distinguish from Benzo(b)fluoranthene)
60._____ [ ] Benzo(g,h,i)perylene
61._____ [ ] Benzo(a)pyrene
62._____ [ ] Berylium
63._____ [ ] Bromodichloromethane
64._____ [ ] Bromomethane (Methyl bromide)
65._____ [ ] 4-Bromophenyl phenyl ether
66._____ [ ] n-Butyl alcohol
256._____ [ ] Butylate (*)
67._____ [ ] Butyl benzyl phthalate
68._____ [ ] 2-sec-Butyl-4,6-dinitrophenol (Dinoseb)
69._____ [ ] Cadmium
257._____ [ ] Carbaryl (*)
258._____ [ ] Carbendazim (*)
259._____ [ ] Carbofuran (*)
260._____ [ ] Carbofuran phenol (*)
70._____ [ ] Carbon disulfide
71._____ [ ] Carbon tetrachloride
261._____ [ ] Carbosulfan (*)
72._____ [ ] Chlordane (alpha and gamma isomers)
73._____ [ ] p-Chloroaniline
74. #1 [X] Chlorobenzene
75._____ [ ] Chlorobenzilate
76._____ [ ] 2-Chloro-1,3-butadiene
77._____ [ ] Chlorodibromomethane
78._____ [ ] Chloroethane
79._____ [ ] bis(2-Chloroethoxy)methane
80._____ [ ] bis(2-Chloroethyl)ether
81._____ [ ] Chloroform
82._____ [ ] bis(2-Chloroisopropyl)ether
83._____ [ ] p-Chloro-m-cresol
84._____ [ ] 2-Chloroethyl vinyl ether (*)
85._____ [ ] Chloromethane (Methyl Chloride)
86._____ [ ] 2-Chloronaphthalene
87._____ [ ] 2-Chlorophenol
88._____ [ ] 3-Chloropropylene
89._____ [ ] Chromium (Total)
90._____ [ ] Chrysene
91._____ [ ] o-Cresol
92._____ [ ] m-Cresol (difficult to distinguish from p-Cresol)
93._____ [ ] p-Cresol (difficult to distinguish from o-Cresol)
262._____ [ ] m-Cumenyl methylcarbamate (*)
94._____ [ ] Cyanides (Total)
95._____ [ ] Cyanides (Amenable)
263._____ [ ] Cycloate (*)
96._____ [ ] Cyclohexanone
97._____ [ ] 1,2-Dibromo-3-chloropropane
98._____ [ ] 1,2-Dibromoethane (Ethylene dibromide)
99._____ [ ] Dibromomethane
100._____ [ ] 2,4-Dichlorophenoxyacetic acid (2,4-D)
101._____ [ ] o,p'-DDD
102._____ [ ] p,p'-DDD
103._____ [ ] o,p'-DDE
104._____ [ ] p,p'-DDE
105._____ [ ] o,p'-DDT
106._____ [ ] p,p'-DDT
107._____ [ ] Dibenz(a,h)anthracene
108._____ [ ] Dibenzo(a,e)pyrene
109. #1 [X] m-Dichlorobenzene
110. #1 [X] o-Dichlorobenzene
111. #1 [X] p-Dichlorobenzene

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112. ______ [ ] Dichlorodifluoromethane
113. ______ [ ] 1,1-Dichloroethane
114. ______ [ ] 1,2-Dichloroethane
115. ______ [ ] 1,1-Dichloroethylene
116. ______ [ ] trans-1,2-Dichloroethylene
117. ______ [ ] 2,4-Dichlorophenol
118. ______ [ ] 2,6-Dichlorophenol
119. ______ [ ] 1,2-Dichloropropane
120. ______ [ ] cis-1,3-Dichloropropylene
121. ______ [ ] trans-1,3-Dichloropropylene
122. ______ [ ] Dieldrin
123. ______ [ ] Diethyl phthalate
124. ______ [ ] 2,4-Dimethyl phenol
125. ______ [ ] Dimethyl phthalate
126. ______ [ ] Di-n-butyl phthalate
127. ______ [ ] 1,4-Dinitrobenzene
128. ______ [ ] 4,6-Dinitro-o-cresol
129. ______ [ ] 2,4-Dinitrophenol
130. ______ [ ] 2,4-Dinitrotoluene
131. ______ [ ] 2,6-Dinitrotoluene
132. ______ [ ] Di-n-octyl phthalate
133. ______ [ ] p-Dimethylaminoazobenzene (*)
134. ______ [ ] Di-n-propylnitrosoamine
135. ______ [ ] 1,4-Dioxane (*)
136. ______ [ ] Diphenylamine (difficult to distinguish from diphenylnitrosamine)
137. ______ [ ] Diphenylnitrosamine (difficult to distinguish from diphenylamine)
138. ______ [ ] 1,2-Diphenylhydrazine
139. ______ [ ] Disulfoton
266. ______ [ ] Dithiocarbamates (Total) (*)
140. ______ [ ] Endosulfan I
141. ______ [ ] Endosulfan II
142. ______ [ ] Endosulfan sulfate
143. ______ [ ] Endrin
144. ______ [ ] Endrin aldehyde
267. ______ [ ] EPTC (*)
145. ______ [ ] Ethyl acetate
146. ______ [ ] Ethyl cyanide (propanenitrile)
147. ______ [ ] Ethyl benzene
148. ______ [ ] Ethyl ether
149. ______ [ ] bis(2-Ethylhexyl)phthalate
150. ______ [ ] Ethyl methacrylate
151. ______ [ ] Ethylene oxide
152. ______ [ ] Famphur
153. ______ [ ] Fluoranthene
154. ______ [ ] Fluorene
155. ______ [ ] Fluoride
268. ______ [ ] Formetanate hydrochloride (*)
156. ______ [ ] Heptachlor
157. ______ [ ] Heptachlor epoxide
158. ______ [ ] Hexachlorobenzene
159. ______ [ ] Hexachlorobutadiene
160. ______ [ ] Hexachlorocylopentadiene
161. ______ [ ] HxCDDs (All hexachlorodibenzo-p-dioxins)
162. ______ [ ] HxCDFs (All hexachlorodibenzo-furans)
163. ______ [ ] Hexachloroethane
164. ______ [ ] Hexachloropropylene
165. ______ [ ] Indeno (1,2,3-c,d)pyrene
270. ______ [ ] 3-Iodo-2-propynyl n-butylcarbamate (*)
166. ______ [ ] Iodomethane
167. ______ [ ] Isobutyl alcohol
168. ______ [ ] Isodrin
169. ______ [ ] Isosafrole
170. ______ [ ] Kepone
171. ______ [ ] Lead
172. ______ [ ] Mercury--Nonwastewater from Retort
173. ______ [ ] Mercury--All others
174. ______ [ ] Methacrylonitrile
175. ______ [ ] Methanol
176. ______ [ ] Methapyrilene
272. ______ [ ] Methiocarb (*)
273. ______ [ ] Methomyl (*)
177. ______ [ ] Methoxychlor
178. ______ [ ] 3-Methylcholanthrene
179. ______ [ ] 4,4-Methylene-bis(2-chloroaniline)
180. ______ [ ] Methylene chloride
181. ______ [ ] Methyl ethyl ketone
182. ______ [ ] Methyl isobutyl ketone
183. ______ [ ] Methyl methacrylate
184. ______ [ ] Methyl methansulfonate
185. ______ [ ] Methyl parathion
274. ______ [ ] Metolcarb (*)
275. ______ [ ] Mexacarbate (*)
276. ______ [ ] Molinate (*)
186. ______ [ ] Naphthalene
187. ______ [ ] 2-Naphthylamine
188. ______ [ ] Nickel
189. ______ [ ] o-Nitroaniline (*)
190. ______ [ ] p-Nitroaniline
191. #1 [X] Nitrobenzene
192. ______ [ ] 5-Nitro-o-toluidine
193. ______ [ ] o-Nitrophenol (*)
194. ______ [ ] p-Nitrophenol
195. ______ [ ] N-Nitrosodiethylamine
196. ______ [ ] N-Nitrosodimethylamine
197. ______ [ ] N-Nitroso-di-n-butylamine
198. ______ [ ] N-Nitrosomethylethylamine
199. ______ [ ] N-Nitrosomorpholine
200. ______ [ ] N-Nitrosopiperidine
201. ______ [ ] N-Nitrosopyrrolidine
277. ______ [ ] Oxamyl (*)
202. ______ [ ] Parathion
203. ______ [ ] Total PCBs (sum of all PCB isomers, or all Arochlors)
278. ______ [ ] Pebulate (*)
204. ______ [ ] Pentachlorobenzene
205. ______ [ ] PeCDDs (All pentachlorodibenzo- p-dioxins)
206. ______ [ ] PeCDFs (All pentachlorodibenzofurans)
207. ______ [ ] Pentachloroethane (*)
208. ______ [ ] Pentachloronitrobenzene
209. ______ [ ] Pentachlorophenol
210. ______ [ ] Phenacetin
211. ______ [ ] Phenanthrene
212. ______ [ ] Phenol
213. ______ [ ] Phorate
214. ______ [ ] Phthalic acid (*)
215. ______ [ ] Phthalic anhydride
280. ______ [ ] Physostigmine (*)
281. ______ [ ] Physostigmine salicylate (*)
282. ______ [ ] Promecarb (*)
216. ______ [ ] Pronamide
283. ______ [ ] Propham (*)
284. ______ [ ] Propoxur (*)
285. ______ [ ] Prosulfocarb (*)
217. ______ [ ] Pyrene
218. ______ [ ] Pyridine
219. ______ [ ] Safrole
220. ______ [ ] Selenium
221. ______ [ ] Silver
222. ______ [ ] Silvex (2,4,5-TP)
223. ______ [ ] Sulfide
224. ______ [ ] 2,4,5-T (2,4,5-Trichlorophenoxyacetic acid)
225. ______ [ ] 1,2,4,5-Tetrachlorobenzene
226. ______ [ ] TCDDs (All tetrachlorodibenzo- p-dioxins)
227. ______ [ ] TCDFs (All tetrachlorodibenzofurans)
228. ______ [ ] 1,1,1,2-Tetrachloroethane
229. ______ [ ] 1,1,2,2-Tetrachloroethane
230. ______ [ ] Tetrachloroethylene

CLEAN HARBORS ENVIRONMENTAL SERVICES, INC.
LAND DISPOSAL RESTRICTION NOTIFICATION FORM LDR-1 ADDENDUM

Manifest No. 01697265 1 JJK

231. ______ [ ] 2,3,4,6-Tetrachlorophenol
232. ______ [ ] Thallium
286. ______ [ ] Thiodicarb (*)
287. ______ [ ] Thiophanate-methyl (*)
233. ______ [ ] Toluene
234. ______ [ ] Toxaphene
289. ______ [ ] Triallate (*)
235. ______ [ ] Tribromomethane (Bromoform)
236. #1 [X] 1,2,4-Trichlorobenzene
237. ______ [ ] 1,1,1-Trichloroethane
238. ______ [ ] 1,1,2-Trichloroethane
239. #1 [X] Trichloroethylene
240. ______ [ ] Trichloromonofluoromethane

241. ______ [ ] 2,4,5-Trichlorophenol
242. ______ [ ] 2,4,6-Trichlorophenol
243. ______ [ ] 1,2,3-Trichloropropane
244. ______ [ ] 1,1,2-Trichloro-1,2,2-trifluoroethane
290. ______ [ ] Triethylamine (*)
245. ______ [ ] tris-(2,3-Dibromopropyl)phosphate
246. ______ [ ] Vanadium (*)
291. ______ [ ] Vernolate (*)
247. ______ [ ] Vinyl chloride
248. ______ [ ] Xylenes--mixed isomers (sum of o-, m-, and p-xylene concentrations)
249. ______ [ ] Zinc (*)

KEY TERMS/DEFINITIONS

CONTAMINANTS SUBJECT TO TREATMENT (CSTT) are the specific constituents listed by waste code number in the Treatment Standard Table in §268.40. CSTT's must be identified for all hazardous debris wastes that are intended for treatment using one of the hazardous debris alternate treatment technologies described in §268.45.

REASONABLY EXPECTED TO BE PRESENT means that the generator is relying on knowledge of the raw materials used, the process, and potential reaction products, or on the results of a one-time analysis for the entire list of UHC's that may be present in the untreated hazardous waste. If a one-time analysis of the entire list of UHC's is conducted, subsequent analyses are required for only those pollutants which would reasonably be expected to be present in the waste as generated, based on the previous sampling and analysis results.

UNDERLYING HAZARDOUS CONSTITUENT (UHC) means any constituent listed in §268.48 Table UTS - Universal Treatment Standards (except fluoride, selenium, sulfides, vanadium and zinc) which can reasonably be expected to be present at the point of generation of the hazardous waste, at a concentration above the constituent-specific UTS treatment standard. [See 40 CFR 268.2]

Please print or type. (Form designed for use on elite (12-pitch) typewriter.) Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator ID Number: M A D 9 9 0 6 8 5 4 2 2
2. Page 1 of: 1
3. Emergency Response Phone: 800 698-1865
4. Manifest Tracking Number: **017306095 JJK**

GENERATOR

5. Generator's Name and Mailing Address
Nyanza Chemical Waste Dump Superfund Site
Megunko Road
Ashland MA 01721

Generator's Site Address (if different than mailing address)

Generator's Phone: 617 918-1327

6. Transporter 1 Company Name: New England Disposal Technologies, inc.
U.S. EPA ID Number: M A C 3 0 0 0 0 8 0 5 9

7. Transporter 2 Company Name
U.S. EPA ID Number

8. Designated Facility Name and Site Address
Clean Harbors of Braintree, Inc.
1 Hill Avenue
Braintree MA 02184
Facility's Phone: 781 380-7100
U.S. EPA ID Number: M A D 0 5 3 4 5 2 6 3 7

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes
X	1. RQ UN3082, WASTE Environmentally hazardous substances, liquid, n.o.s. (dichlorobenzene, trichloroethylene) 9, PGIII	001	TT	399	G	D021 D027 D036 D040
	2.					
	3.					
	4.					

14. Special Handling Instructions and Additional Information 1)CH804730 ERG#171

Job# 07-19410 Sales Order #1703905908

15. **GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name: Jeff Brunelle for EPA
Signature: [signature]
Month 8 Day 17 Year 17

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter signature (for exports only): Date leaving U.S.:

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials
Transporter 1 Printed/Typed Name: Shaun Kelly
Signature: [signature]
Month 8 Day 17 Year 17

Transporter 2 Printed/Typed Name
Signature
Month Day Year

DESIGNATED FACILITY

18. Discrepancy
18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

18b. Alternate Facility (or Generator)
U.S. EPA ID Number
Facility's Phone:

18c. Signature of Alternate Facility (or Generator)
Month Day Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)
1. 2. 3. 4.

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a
Printed/Typed Name
Signature
Month Day Year

EPA Form 8700-22 (Rev. 3-05) Previous editions are obsolete.

GENERATOR'S INITIAL COPY

Job # 07-19410

Day & Date Thursday 8/17/17

Contact Person Dominic Mattioni Jr.

Telephone 603-724-6232 Direct

Client Nobis Engineering

Billing Address 18 Chenell Dr

Concord NH

Attn: 03301

NEDT® NEW ENGLAND DISPOSAL TECHNOLOGIES, INC.

83 Gilmore Drive • Sutton, MA 01590

Tel: (508) 234-4440 Fax: (508) 234-4441

www.NEDTINC.com

Start Time 900 Stop Time

Job Location Nyanza

Megunko Road

Ashland Ma 01721

Site Contact Person Jeff Brunelle

Phone 603-508-0084 cell

LABOR: Nobis Contact: Jeff Brunelle (978) 703-6038

NAME	TITLE	ST	OT
	Supervisor		
	Foreman		
	Field Chemist		
Shaun Kelly	Eq. Op. SM. Vac		
	Eq. Op.		
	Eq. Op.		
	Eq. Op.		
	Eq. Op.		
	Field Technician		
	Field Technician		
	Field Technician		
	Field Technician		
	Field Technician		
	Field Technician		
	Field Technician		

MATERIAL:

QTY	DESCRIPTION	QTY	DESCRIPTION
	Level B PPE		Roll Off Liner
	Level C PPE		Poly Bags
	Modified Level D PPE		Bags Vermiculite
	Speedi Dry		5 Gallon Pail
	Sorbent Pads Bale		15 Gallon Drum
	Sorbent Boom Bale		30 Gallon Drum
	Flex Hose 4" 6"		55 Gallon Drum
	Fill Material		Overpack Drum
			Poly Sheeting

DISPOSAL:

FACILITY	QTY./DESC.	MANIFEST #
Clean Harbors	Gals	017306095JJK
	DNAPL	

EQUIPMENT:

QTY		Fleet#	HRS.
	Service Trucks		
	Chemist Support Van		
	Box Truck with Liftgate		
	Dump Truck		
	Roll Off Truck		
	Roll Off Truck		
	Roll Off Trailer		
	Roll Off Trailer		
	Roll Off Container #		
	Roll Off Container #		
	Roll Off Container #		
	Roll Off Container #		
	Roll Off Container #		
✓	Vacuum Tank Truck	665	
	Vacuum Trailer		
	Tractor		
	Vactor		
	Dump Trailer		
	Lowbed Trailer		
	Bobcat		
	Excavator ☐ SM ☐ LG		
	Backhoe		
	Utility Trailer		
	Confined Space Rescue Set		
	Meter ☐ 4 Gas ☐ PID		
	Compressor/Blower		
	Sawzall ☐ Cutoff ☐		
	Generator		
	Pressure Washer		
	Demo Hammer		
	Cascade Air Line System		
	Pumps		
	Emergency Response Trailer		
	Drum Loader		
	Vibrating Compactor		
	Power Broom		
	Miscellaneous Tools & Disposables		
	Police Detail		

JOB DESCRIPTION:

Customer Signature: [signature] Date 8/17/17

NEDT Rep.: Date

Comments: ON Site FOR 10:00AM

CLEAN HARBORS ENVIRONMENTAL SERVICES, INC.
LAND DISPOSAL RESTRICTION FORM LDR-1

MANIFEST NO 017306095 JJK

THE HAZARDOUS WASTES IDENTIFIED ON THE HAZARDOUS WASTE MANIFEST IDENTIFIED ABOVE AND BEARING THE EPA HAZARDOUS WASTE CODES LISTED BELOW ARE RESTRICTED WASTES WHICH ARE PROHIBITED FROM LAND DISPOSAL WITHOUT FURTHER TREATMENT UNDER THE LAND DISPOSAL RESTRICTIONS, 40 CFR PART 268 .7 (a)(2), AND RCRA SECTION 3004(D). IN ACCORDANCE WITH 40 CFR 268.7(a), THE EPA WASTE CODE, WASTE SUBCATEGORY, AND TREATABILITY GROUPS, AS APPLICABLE, ARE INCLUDED BELOW.

INSTRUCTIONS -- COMPLETE ALL SECTIONS. REFER TO PAGE 3 OF THIS FORM FOR KEY TERMS/DEFINITIONS.

Column 1 - Line Item: Enter the manifest line item number (e.g., 11a) that corresponds to the waste code(s).
Column 2 - Waste Codes/Subcategory: Check off all applicable waste codes. For D001 through D043, also check applicable subcategory; for F001 through F005, check applicable constituents.
Column 3 - Wastewater/Non-wastewater: Check off "WW" for wastewater and "Non-WW" for non-wastewaters.
Column 4 - LDR Handling Code: Circle the appropriate handling code, as follows:

1 = The waste is a characteristic hazardous waste D001, D002, D003, D004-D011, or D018-43 which is intended for treatment/disposal in a CWA system, CWA-equivalent system, or Class I SDWA system. Underlying Hazardous Constituents (UHC's) are NOT required to be identified.

1A = The waste is a characteristic hazardous waste D001 High TOC Ignitable Liquids Subcategory (i.e., greater than or equal to 10% TOC). Pursuant to 40 CFR 268.40, the waste must be treated using organic recovery (RORGS) or combustion (CMBST) technology. UHC's are NOT required to be identified.

2 = The waste is a characteristic hazardous waste D001 (other than High TOC Ignitable Liquids), D002, D003 Explosive, Water Reactive or Other Reactive subcategory, D004-D011, D012-17 non-wastewater, or D018-43 which is intended for treatment/disposal in a non-CWA system, non-CWA-equivalent system, or non-Class I SDWA system located in the United States. All UHC's which are reasonably expected to be present must be identified, except for D001 waste that is intended to be treated using organic recovery (RORGS) or combustion (CMBST) technologies. Identify UHC's by completing Sections I and IV of CHI Form LDR-1 Addendum and attach completed Addendum to this form.

3 = The waste is a characteristic (i.e., D-code) or listed (i.e., F-, K-, U-, or P-code) hazardous waste which is intended for export and treatment/disposal at a facility located outside the United States. LDR treatment standards do not apply to hazardous waste treated/disposed in a foreign country, and per USEPA guidance, the identification of UHC's (if applicable) is not required for hazardous waste that is intended to be exported. Note however that if the exported waste is subsequently returned for treatment/disposal in the United States, all applicable LDR regulations would apply and a revised LDR notification would be required.

4 = The waste meets the definition of hazardous debris pursuant to 40 CFR 268.2(h) and is intended for treatment/ disposal in compliance with the alternate debris treatment technologies of 40 CFR 268.45. In accordance with the requirements of 40 CFR 268.7(a)(2) : the contaminants subject to treatment (CSTT's) must be identified as part of this notification. Identify CSTT's by completing Section III and IV of the CHI Form LDR-1 Addendum and attach completed Addendum to this form. These constituents are being treated to comply with 40 CFR 268.45.

5 = The waste is a characteristic waste D003 Reactive Sulfide, Reactive Cyanide, or Unexploded Ordnance subcategory, a characteristic waste D012- 17 wastewater, or a listed (i.e., F-, K-, U-, or P-code) hazardous waste. UHC's are NOT required to be identified.

6 = The waste is a lab pack that is intended for incineration using the alternative lab pack treatment standard under 40 CFR 268.42(c). UHC's are NOT required to be identified; however, the generator must complete and attach the lab pack certification statement on CHI Form LDR-LP. Note that in accordance with 40 CFR Part 268 Appendix IV, lab packs which contain waste codes D009, F019, K003, K004, K005, K006, K062, K071, K100, K106, P010, P011, P012, P076, P078, U134, and U151 are not eligible for alternative lab pack treatment standard.

*** **NOTE: IF THE WASTE IS A SOIL CONTAMINATED WITH A LISTED OR CHARACTERISTIC WASTE AND THE GENERATOR WANTS TO USE THE ALTERNATE TREATMENT STANDARD FOR SOILS, CONTACT CORPORATE COMPLIANCE FOR THE APPROPRIATE LDR NOTIFICATION FORM.**

SECTION I. CHARACTERISTIC WASTES D001 THROUGH D043

COLUMN 1: LINE ITEM SEE MANIFEST	COLUMN 2: WASTE CODE / SUBCATEGORY	COLUMN 3: WASTEWATER/ NON-WASTEWATER	COLUMN 4: HANDLING CODE
________	[ ] D001 Ignitables, except High TOC subcategory	[ ] WW [ ] Non-WW	1 2 3 4 6
________	[ ] D001 High TOC Ignitable Liquids Subcategory (Greater than or equal to 10% TOC)	[ ] Non-WW only	1A 3 6
________	[ ] D002 Corrosives	[ ] WW [ ] Non-WW	1 2 3 4 6
________	[ ] D003		
	[ ] Reactive Sulfide, per 261.23 (a)(5)	[ ] WW [ ] Non-WW	1 3 4 5 6
	[ ] Reactive Cyanide, per 261.23(a)(5)	[ ] WW [ ] Non-WW	1 3 4 5 6
	[ ] Explosive, per 261.23(a)(6), (7) & (8)	[ ] WW [ ] Non-WW	1 2 3 4 6
	[ ] Water Reactive, per 261.23(a)(2), (3) & (4)	[ ] Non-WW only	1 2 3 4 6
	[ ] Other Reactive, per 261.23(a)(1)	[ ] WW [ ] Non-WW	1 2 3 4 6
	[ ] Unexploded Ordnance, Emergency Response	[ ] WW [ ] Non-WW	1 3 4 5 6
________	[ ] D004 Arsenic	[ ] WW [ ] Non-WW	1 2 3 4 6
________	[ ] D005 Barium	[ ] WW [ ] Non-WW	1 2 3 4 6
________	[ ] D006		
	[ ] Cadmium	[ ] WW [ ] Non-WW	1 2 3 4 6
	[ ] Cadmium Containing Batteries	[ ] Non-WW only	2 3 6
________	[ ] D007 Chromium	[ ] WW [ ] Non-WW	1 2 3 4 6
________	[ ] D008		
	[ ] Lead	[ ] WW [ ] Non-WW	1 2 3 4 6
	[ ] Lead Acid Batteries	[ ] Non-WW only	2 3 6

CLEAN HARBORS ENVIRONMENTAL SERVICES, INC.
LAND DISPOSAL RESTRICTION FORM LDR-1

MANIFEST NO 01730695 JJK

SECTION I. CHARACTERISTIC WASTES D001-43 (CONTINUED)

COLUMN 1: LINE ITEM SEE MANIFEST	COLUMN 2: WASTE CODE / SUBCATEGORY	COLUMN 3: WASTEWATER/ NON-WASTEWATER	COLUMN 4: HANDLING CODE
______	[ ] D009		
	[ ] Low Mercury, less than 260 mg/kg Mercury	[ ] WW [ ] Non-WW	1 2 3 4
	[ ] High Mercury Organic Subcategory	[ ] Non-WW only	2 3 4
	[ ] High Mercury Inorganic Subcategory	[ ] Non-WW only	2 3 4
______	[ ] D010 Selenium	[ ] WW [ ] Non-WW	1 2 3 4 6
______	[ ] D011 Silver	[ ] WW [ ] Non-WW	1 2 3 4 6
______	[ ] D012 Endrin	[ ] WW [ ] Non-WW	2 3 4 5 6
______	[ ] D013 Lindane	[ ] WW [ ] Non-WW	2 3 4 5 6
______	[ ] D014 Methoxychlor	[ ] WW [ ] Non-WW	2 3 4 5 6
______	[ ] D015 Toxaphene	[ ] WW [ ] Non-WW	2 3 4 5 6
______	[ ] D016 2,4-D	[ ] WW [ ] Non-WW	2 3 4 5 6
______	[ ] D017 2,4,5-TP (Silvex)	[ ] WW [ ] Non-WW	2 3 4 5 6
______	[ ] D018 Benzene	[ ] WW [ ] Non-WW	1 2 3 4 6
______	[ ] D019 Carbon tetrachloride	[ ] WW [ ] Non-WW	1 2 3 4 6
______	[ ] D020 Chlordane	[ ] WW [ ] Non-WW	1 2 3 4 6
*1	[X] D021 Chlorobenzene	[ ] WW [X] Non-WW	1 2 3 4 6
______	[ ] D022 Chloroform	[ ] WW [ ] Non-WW	1 2 3 4 6
______	[ ] D023 o-Cresol	[ ] WW [ ] Non-WW	1 2 3 4 6
______	[ ] D024 m-Cresol	[ ] WW [ ] Non-WW	1 2 3 4 6
______	[ ] D025 p-Cresol	[ ] WW [ ] Non-WW	1 2 3 4 6
______	[ ] D026 Cresol	[ ] WW [ ] Non-WW	1 2 3 4 6
*1	[X] D027 1,4-Dichlorobenzene	[ ] WW [X] Non-WW	1 2 3 4 6
______	[ ] D028 1,2-Dichloroethane	[ ] WW [ ] Non-WW	1 2 3 4 6
______	[ ] D029 1,1-Dichloroethylene	[ ] WW [ ] Non-WW	1 2 3 4 6
______	[ ] D030 2,4-Dinitrotoluene	[ ] WW [ ] Non-WW	1 2 3 4 6
______	[ ] D031 Heptachlor (and its epoxide)	[ ] WW [ ] Non-WW	1 2 3 4 6
______	[ ] D032 Hexachlorobenzene	[ ] WW [ ] Non-WW	1 2 3 4 6
______	[ ] D033 Hexachlorobutadiene	[ ] WW [ ] Non-WW	1 2 3 4 6
______	[ ] D034 Hexachloroethane	[ ] WW [ ] Non-WW	1 2 3 4 6
______	[ ] D035 Methyl ethyl ketone	[ ] WW [ ] Non-WW	1 2 3 4 6
*1	[X] D036 Nitrobenzene	[ ] WW [X] Non-WW	1 2 3 4 6
______	[ ] D037 Pentachlorophenol	[ ] WW [ ] Non-WW	1 2 3 4 6
______	[ ] D038 Pyridine	[ ] WW [ ] Non-WW	1 2 3 4 6
______	[ ] D039 Tetrachloroethylene	[ ] WW [ ] Non-WW	1 2 3 4 6
*1	[X] D040 Trichloroethylene	[ ] WW [X] Non-WW	1 2 3 4 6
______	[ ] D041 2,4,5-Trichlorophenol	[ ] WW [ ] Non-WW	1 2 3 4 6
______	[ ] D042 2,4,6-Trichlorophenol	[ ] WW [ ] Non-WW	1 2 3 4 6
______	[ ] D043 Vinyl Chloride	[ ] WW [ ] Non-WW	1 2 3 4 6

SECTION II. SPENT SOLVENT WASTES F001 THROUGH F005

COLUMN 1: LINE ITEM SEE MANIFEST	COLUMN 2: WASTE CODE / SUBCATEGORY	COLUMN 3: WASTEWATER/ NON-WASTEWATER	COLUMN 4: HANDLING CODE
______	[ ] F001 [ ] F002 [ ] F003 [ ] F004 [ ] F005	[ ] WW [ ] Non-WW	3 4 5 6

______ [ ] 1. ALL F001-F005
______ [ ] 2. Acetone
______ [ ] 3. Benzene
______ [ ] 4. n-Butyl alcohol
______ [ ] 5. Carbon disulfide
______ [ ] 6. Carbon tetrachloride
______ [ ] 7. Chlorobenzene
______ [ ] 8. o-Cresol
______ [ ] 9. m-Cresol (difficult to distinguish from p-cresol)
______ [ ] 10. p-Cresol (difficult to distinguish from m-cresol)
______ [ ] 11. Cresol - mixed isomers (sum of o-, m- and p-cresol)

______ [ ] 12. Cyclohexanone
______ [ ] 13. o-Dichlorobenzene
______ [ ] 14. 2-Ethoxyethanol (F005 only)
______ [ ] 15. Ethyl acetate
______ [ ] 16. Ethyl benzene
______ [ ] 17. Ethyl ether
______ [ ] 18. Isobutyl alcohol
______ [ ] 19. Methanol
______ [ ] 20. Methylene chloride
______ [ ] 21. Methyl ethyl ketone
______ [ ] 22. Methyl isobutyl ketone
______ [ ] 23. Nitrobenzene
______ [ ] 24. 2-Nitropropane (F005 only)

______ [ ] 25. Pyridine
______ [ ] 26. Tetrachloroethylene
______ [ ] 27. Toluene
______ [ ] 28. 1,1,1-Trichloroethane
______ [ ] 29. 1,1,2-Trichloroethane
______ [ ] 30. Trichloroethylene
______ [ ] 31. 1,1,2-Trichloro-1,2,2-trifluoroethane
______ [ ] 32. Trichloromonofluoromethane
______ [ ] 33. Xylene - mixed isomers (sum of o-, m-, and p-xylene)

CLEAN HARBORS ENVIRONMENTAL SERVICES, INC.
LAND DISPOSAL RESTRICTION FORM LDR-1

MANIFEST NO 017306095 JJK

SECTION III. CALIFORNIA LIST WASTES

COLUMN 1: LINE ITEM SEE MANIFEST	COLUMN 2: WASTE CODE / SUBCATEGORY	COLUMN 3: WASTEWATER/ NON-WASTEWATER	COLUMN 4: HANDLING CODE
______	Hazardous waste containing one or more of the following California List constituents:	[ ] WW [ ] Non-WW	1 2 3 4 6

[ ] ALL CALIFORNIA LIST CONSTITUENTS
[ ] Liquids with nickel greater than or equal to 134 mg/l
[ ] Liquids with thallium greater than or equal to 130 mg/l
[ ] Liquids with PCB's > or = 50 ppm
[ ] Waste containing HOC's > or = 1,000 mg/kg

SECTION IV. OTHER LISTED WASTES (F006-12, F019-F028, F037-38, F039, K-, U-, AND P-CODES)

COLUMN 1: LINE ITEM SEE MANIFEST	COLUMN 2: WASTE CODE / SUBCATEGORY	COLUMN 3: WASTEWATER/ NON-WASTEWATER	COLUMN 4: HANDLING CODE
______	______	[ ] WW [ ] Non-WW	3 4 5 6
______	______	[ ] WW [ ] Non-WW	3 4 5 6
______	______	[ ] WW [ ] Non-WW	3 4 5 6
______	______	[ ] WW [ ] Non-WW	3 4 5 6
______	______	[ ] WW [ ] Non-WW	3 4 5 6

[ ] CHECK HERE IF ADDITIONAL LISTED WASTE CODES ARE PRESENT. COMPLETE AND ATTACH LDR-1 CONTINUATION SHEET.
[ ] CHECK HERE IF WASTE CODE F039 (MULTISOURCE LEACHATE) IS PRESENT. IDENTIFY F039 CONSTITUENTS BY COMPLETING SECTIONS II AND IV OF CHI FORM LDR-1 ADDENDUM AND ATTACH COMPLETED ADDENDUM TO THIS FORM.

SECTION V. CONTACT NAME AND DATE

Print Name: ______________________ Date: ______________________

KEY TERMS/DEFINITIONS

CLASS I SDWA SYSTEM means a Class I deep well facility regulated under the Safe Drinking Water Act (SDWA).

CWA SYSTEM means a centralized wastewater treatment facility discharging under a Clean Water Act (CWA) permit. For example, a CWA facility would treat organic or inorganic aqueous wastes and discharge the treated effluent to the local sewer system. Examples of CWA treatment systems owned and operated by Clean Harbors include the wastewater treatment operations at Baltimore (including the CES system), Bristol, Chicago, Cincinnati and Cleveland.

CWA-EQUIVALENT SYSTEM means a "zero discharge system" that engages in "CWA-equivalent" treatment before land disposal. Zero-discharge facilities treat hazardous wastes using "CWA-equivalent" treatment methods, but do not discharge the treatment effluent to a sewer or water body (e.g., spray irrigation land farm). "CWA-equivalent" treatment methods means biological treatment for organics, alkaline chlorination, or ferrous sulfate precipitation for cyanide, precipitation/ sedimentation for metals, reduction of hexavalent chromium, or other treatment technology that can be demonstrated to perform equally or greater than these technologies.

HIGH TOC IGNITABLE LIQUIDS SUBCATEGORY means an ignitable liquid hazardous waste (waste code D001) which contains greater than or equal to 10% total organic carbon (TOC). Pursuant to 40 CFR 268.40, such wastes must be treated using organic recovery (RORGS) or combustion (CMBST) technology. Examples of RORGS technologies include the CES unit at Clean Harbors of Baltimore. Examples of CMBST technologies include hazardous waste fuel blending and subsequent reuse at a cement kiln, or destruction at a RCRA incinerator.

WASTEWATERS are wastes that contain less than 1% by weight total organic carbon (TOC) and less than 1% by weight total suspended solids (TSS). [See 40 CFR 268.2(f)]

CLEAN HARBORS ENVIRONMENTAL SERVICES, INC.
LAND DISPOSAL RESTRICTION NOTIFICATION FORM LDR-1 ADDENDUM Manifest No. 017306095 JJK

SECTION I. UNDERLYING HAZARDOUS CONSTITUENTS (UHC'S)

[X] Check here if one or more of the constituents listed in Section IV below are reasonably expected to be present as an "Underlying Hazardous Constituent" in the waste. Then in Section IV, check off each constituent. Note that per the definition of UHC in 40 CFR 268.2, fluoride, selenium, sulfides, vanadium and zinc are NOT regulated as UHC's.

[ ] Check here if NONE of the UHC constituents listed in Section IV are expected to be present in the waste.

SECTION II. MULTI-SOURCE LEACHATE (WASTE CODE F039)

[ ] Check here if one or more of the constituents listed in Section IV are present as a constituent in the multi-source leachate (F039) waste. Then in Section IV below, check off each constituent. Note that constituents which are identified by an asterisk (*) are NOT regulated as F039 constituents.

[ ] Check here if NONE of the F039 constituents listed in Section IV are present in the waste.

SECTION III. HAZARDOUS DEBRIS CONTAMINANTS SUBJECT TO TREATMENT (CSTT)

[ ] Check here if one or more of the constituents listed in Section IV is a CSTT for hazardous debris that is intended for treatment using the alternate treatment technologies in 40 CFR 268.45. To identify CSTT's, refer to the "Regulated Hazardous Constituent" column in the Treatment Standard Table in 40 CFR 268.40. Then, in Section IV below, check off the constituents that appear for each waste code used to identify the debris.

[ ] Check here if the entry in the "Regulated Hazardous Constituent" column in the Treatment Standard Table in 40 CFR 268.40 is "Not Applicable", i.e. D001, D002, and D003 (non-cyanides subcategories only).

SECTION IV. LIST OF CONSTITUENTS - INCLUDE MANIFEST LINE ITEM

34.______ [ ] Acenaphthylene
35.______ [ ] Acenaphthene
36.______ [ ] Acetone
37.______ [ ] Acetonitrile
38.______ [ ] Acetophenone
39.______ [ ] 2-Acetylaminofluorene
40.______ [ ] Acrolein
41.______ [ ] Acrylamide (*)
42.______ [ ] Acrylonitrile
251.______ [ ] Aldicarb sulfone (*)
43.______ [ ] Aldrin
44.______ [ ] 4-Aminobiphenyl
45. #1 [X] Aniline
46.______ [ ] Anthracene
47.______ [ ] Antimony
48.______ [ ] Aramite
49.______ [ ] Arsenic
50.______ [ ] alpha-BHC
51.______ [ ] beta-BHC
52.______ [ ] delta-BHC
53.______ [ ] gamma-BHC
252.______ [ ] Barban (*)
54.______ [ ] Barium
253.______ [ ] Bendiocarb (*)
255.______ [ ] Benomyl (*)
55.______ [ ] Benzene
56.______ [ ] Benz(a)anthracene
57.______ [ ] Benzal chloride (*)
58.______ [ ] Benzo(b)fluoranthene (difficult to distinguish from Benzo(k)fluoranthene)
59.______ [ ] Benzo(k)fluoranthene (difficult to distinguish from Benzo(b)fluoranthene)
60.______ [ ] Benzo(g,h,i)perylene
61.______ [ ] Benzo(a)pyrene
62.______ [ ] Berylium
63.______ [ ] Bromodichloromethane
64.______ [ ] Bromomethane (Methyl bromide)
65.______ [ ] 4-Bromophenyl phenyl ether
66.______ [ ] n-Butyl alcohol
256.______ [ ] Butylate (*)
67.______ [ ] Butyl benzyl phthalate
68.______ [ ] 2-sec-Butyl-4,6-dinitrophenol (Dinoseb)
69.______ [ ] Cadmium
257.______ [ ] Carbaryl (*)
258.______ [ ] Carbendazim (*)
259.______ [ ] Carbofuran (*)
260.______ [ ] Carbofuran phenol (*)
70.______ [ ] Carbon disulfide
71.______ [ ] Carbon tetrachloride
261.______ [ ] Carbosulfan (*)
72.______ [ ] Chlordane (alpha and gamma isomers)
73.______ [ ] p-Chloroaniline
74. #1 [X] Chlorobenzene
75.______ [ ] Chlorobenzilate
76.______ [ ] 2-Chloro-1,3-butadiene
77.______ [ ] Chlorodibromomethane
78.______ [ ] Chloroethane
79.______ [ ] bis(2-Chloroethoxy)methane
80.______ [ ] bis(2-Chloroethyl)ether
81.______ [ ] Chloroform
82.______ [ ] bis(2-Chloroisopropyl)ether
83.______ [ ] p-Chloro-m-cresol
84.______ [ ] 2-Chloroethyl vinyl ether (*)
85.______ [ ] Chloromethane (Methyl Chloride)
86.______ [ ] 2-Chloronaphthalene
87.______ [ ] 2-Chlorophenol
88.______ [ ] 3-Chloropropylene
89.______ [ ] Chromium (Total)
90.______ [ ] Chrysene
91.______ [ ] o-Cresol
92.______ [ ] m-Cresol (difficult to distinguish from p-Cresol)
93.______ [ ] p-Cresol (difficult to distinguish from o-Cresol)
262.______ [ ] m-Cumenyl methylcarbamate (*)
94.______ [ ] Cyanides (Total)
95.______ [ ] Cyanides (Amenable)
263.______ [ ] Cycloate (*)
96.______ [ ] Cyclohexanone
97.______ [ ] 1,2-Dibromo-3-chloropropane
98.______ [ ] 1,2-Dibromoethane (Ethylene dibromide)
99.______ [ ] Dibromomethane
100.______ [ ] 2,4-Dichlorophenoxyacetic acid (2,4-D)
101.______ [ ] o,p'-DDD
102.______ [ ] p,p'-DDD
103.______ [ ] o,p'-DDE
104.______ [ ] p,p'-DDE
105.______ [ ] o,p'-DDT
106.______ [ ] p,p'-DDT
107.______ [ ] Dibenz(a,h)anthracene
108.______ [ ] Dibenzo(a,e)pyrene
109. #1 [X] m-Dichlorobenzene
110. #1 [X] o-Dichlorobenzene
111. #1 [X] p-Dichlorobenzene

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112. ______ [ ] Dichlorodifluoromethane
113. ______ [ ] 1,1-Dichloroethane
114. ______ [ ] 1,2-Dichloroethane
115. ______ [ ] 1,1-Dichloroethylene
116. ______ [ ] trans-1,2-Dichloroethylene
117. ______ [ ] 2,4-Dichlorophenol
118. ______ [ ] 2,6-Dichlorophenol
119. ______ [ ] 1,2-Dichloropropane
120. ______ [ ] cis-1,3-Dichloropropylene
121. ______ [ ] trans-1,3-Dichloropropylene
122. ______ [ ] Dieldrin
123. ______ [ ] Diethyl phthalate
124. ______ [ ] 2,4-Dimethyl phenol
125. ______ [ ] Dimethyl phthalate
126. ______ [ ] Di-n-butyl phthalate
127. ______ [ ] 1,4-Dinitrobenzene
128. ______ [ ] 4,6-Dinitro-o-cresol
129. ______ [ ] 2,4-Dinitrophenol
130. ______ [ ] 2,4-Dinitrotoluene
131. ______ [ ] 2,6-Dinitrotoluene
132. ______ [ ] Di-n-octyl phthalate
133. ______ [ ] p-Dimethylaminoazobenzene (*)
134. ______ [ ] Di-n-propylnitrosoamine
135. ______ [ ] 1,4-Dioxane (*)
136. ______ [ ] Diphenylamine (difficult to distinguish from
137. ______ [ ] Diphenylnitrosamine (difficult to distinguish from
diphenylamine)
138. ______ [ ] 1,2-Diphenylhydrazine
139. ______ [ ] Disulfoton
266. ______ [ ] Dithiocarbamates (Total) (*)
140. ______ [ ] Endosulfan I
141. ______ [ ] Endosulfan II
142. ______ [ ] Endosulfan sulfate
143. ______ [ ] Endrin
144. ______ [ ] Endrin aldehyde
267. ______ [ ] EPTC (*)
145. ______ [ ] Ethyl acetate
146. ______ [ ] Ethyl cyanide (propanenitrile)
147. ______ [ ] Ethylbenzene
148. ______ [ ] Ethyl ether
149. ______ [ ] bis(2-Ethylhexyl)phthalate
150. ______ [ ] Ethyl methacrylate
151. ______ [ ] Ethylene oxide
152. ______ [ ] Famphur
153. ______ [ ] Fluoranthene
154. ______ [ ] Fluorene
155. ______ [ ] Fluoride
268. ______ [ ] Formetanate hydrochloride (*)
156. ______ [ ] Heptachlor
157. ______ [ ] Heptachlor epoxide
158. ______ [ ] Hexachlorobenzene
159. ______ [ ] Hexachlorobutadiene
160. ______ [ ] Hexachlorocylopentadiene
161. ______ [ ] HxCDDs (All hexachlorodibenzo-p-dioxins)
162. ______ [ ] HxCDFs (All hexachlorodibenzo-furans)
163. ______ [ ] Hexachloroethane
164. ______ [ ] Hexachloropropylene
165. ______ [ ] Indeno (1,2,3-c,d)pyrene
270. ______ [ ] 3-Iodo-2-propynyl n-butylcarbamate (*)
166. ______ [ ] Iodomethane
167. ______ [ ] Isobutyl alcohol
168. ______ [ ] Isodrin
169. ______ [ ] Isosafrole
170. ______ [ ] Kepone
171. ______ [ ] Lead
172. ______ [ ] Mercury--Nonwastewater from Retort
173. ______ [ ] Mercury--All others
174. ______ [ ] Methacrylonitrile
175. ______ [ ] Methanol

176. ______ [ ] Methapyrilene
272. ______ [ ] Methiocarb (*)
273. ______ [ ] Methomyl (*)
177. ______ [ ] Methoxychlor
178. ______ [ ] 3-Methylcholanthrene
179. ______ [ ] 4,4-Methylene-bis(2-chloroaniline)
180. ______ [ ] Methylene chloride
181. ______ [ ] Methyl ethyl ketone
182. ______ [ ] Methyl isobutyl ketone
183. ______ [ ] Methyl methacrylate
184. ______ [ ] Methyl methansulfonate
185. ______ [ ] Methyl parathion
274. ______ [ ] Metolcarb (*)
275. ______ [ ] Mexacarbate (*)
276. ______ [ ] Molinate (*)
186. ______ [ ] Naphthalene
187. ______ [ ] 2-Naphthylamine
188. ______ [ ] Nickel
189. ______ [ ] o-Nitroaniline (*)
190. ______ [ ] p-Nitroaniline
191. #1 [X] Nitrobenzene
192. ______ [ ] 5-Nitro-o-toluidine
193. ______ [ ] o-Nitrophenol (*)
diphenylnitrosamine)
194. ______ [ ] p-Nitrophenol
195. ______ [ ] N-Nitrosodiethylamine
196. ______ [ ] N-Nitrosodimethylamine
197. ______ [ ] N-Nitroso-di-n-butylamine
198. ______ [ ] N-Nitrosomethylethylamine
199. ______ [ ] N-Nitrosomorpholine
200. ______ [ ] N-Nitrosopiperidine
201. ______ [ ] N-Nitrosopyrrolidine
277. ______ [ ] Oxamyl (*)
202. ______ [ ] Parathion
203. ______ [ ] Total PCBs (sum of all PCB isomers, or all Arochlors)
278. ______ [ ] Pebulate (*)
204. ______ [ ] Pentachlorobenzene
205. ______ [ ] PeCDDs (All pentachlorodibenzo- p-dioxins)
206. ______ [ ] PeCDFs (All pentachlorodibenzofurans)
207. ______ [ ] Pentachloroethane (*)
208. ______ [ ] Pentachloronitrobenzene
209. ______ [ ] Pentachlorophenol
210. ______ [ ] Phenacetin
211. ______ [ ] Phenanthrene
212. ______ [ ] Phenol
213. ______ [ ] Phorate
214. ______ [ ] Phthalic acid (*)
215. ______ [ ] Phthalic anhydride
280. ______ [ ] Physostigmine (*)
281. ______ [ ] Physostigmine salicylate (*)
282. ______ [ ] Promecarb (*)
216. ______ [ ] Pronamide
283. ______ [ ] Propham (*)
284. ______ [ ] Propoxur (*)
285. ______ [ ] Prosulfocarb (*)
217. ______ [ ] Pyrene
218. ______ [ ] Pyridine
219. ______ [ ] Safrole
220. ______ [ ] Selenium
221. ______ [ ] Silver
222. ______ [ ] Silvex (2,4,5-TP)
223. ______ [ ] Sulfide
224. ______ [ ] 2,4,5-T (2,4,5-Trichlorophenoxyacetic acid)
225. ______ [ ] 1,2,4,5-Tetrachlorobenzene
226. ______ [ ] TCDDs (All tetrachlorodibenzo- p-dioxins)
227. ______ [ ] TCDFs (All tetrachlorodibenzofurans)
228. ______ [ ] 1,1,1,2-Tetrachloroethane
229. ______ [ ] 1,1,2,2-Tetrachloroethane
230. ______ [ ] Tetrachloroethylene

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231. ______ [ ] 2,3,4,6-Tetrachlorophenol
232. ______ [ ] Thallium
286. ______ [ ] Thiodicarb (*)
287. ______ [ ] Thiophanate-methyl (*)
233. ______ [ ] Toluene
234. ______ [ ] Toxaphene
289. ______ [ ] Triallate (*)
235. ______ [ ] Tribromomethane (Bromoform)
236. #1 [X] 1,2,4-Trichlorobenzene
237. ______ [ ] 1,1,1-Trichloroethane
238. ______ [ ] 1,1,2-Trichloroethane
239. #1 [X] Trichloroethylene
240. ______ [ ] Trichloromonofluoromethane

241. ______ [ ] 2,4,5-Trichlorophenol
242. ______ [ ] 2,4,6-Trichlorophenol
243. ______ [ ] 1,2,3-Trichloropropane
244. ______ [ ] 1,1,2-Trichloro-1,2,2-trifluoroethane
290. ______ [ ] Triethylamine (*)
245. ______ [ ] tris-(2,3-Dibromopropyl)phosphate
246. ______ [ ] Vanadium (*)
291. ______ [ ] Vernolate (*)
247. ______ [ ] Vinyl chloride
248. ______ [ ] Xylenes--mixed isomers (sum of o-, m-, and p-xylene concentrations)
249. ______ [ ] Zinc (*)

KEY TERMS/DEFINITIONS

CONTAMINANTS SUBJECT TO TREATMENT (CSTT) are the specific constituents listed by waste code number in the Treatment Standard Table in §268.40. CSTT's must be identified for all hazardous debris wastes that are intended for treatment using one of the hazardous debris alternate treatment technologies described in §268.45.

REASONABLY EXPECTED TO BE PRESENT means that the generator is relying on knowledge of the raw materials used, the process, and potential reaction products, or on the results of a one-time analysis for the entire list of UHC's that may be present in the untreated hazardous waste. If a one-time analysis of the entire list of UHC's is conducted, subsequent analyses are required for only those pollutants which would reasonably be expected to be present in the waste as generated, based on the previous sampling and analysis results.

UNDERLYING HAZARDOUS CONSTITUENT (UHC) means any constituent listed in §268.48 Table UTS - Universal Treatment Standards (except fluoride, selenium, sulfides, vanadium and zinc) which can reasonably be expected to be present at the point of generation of the hazardous waste, at a concentration above the constituent-specific UTS treatment standard. [See 40 CFR 268.2]